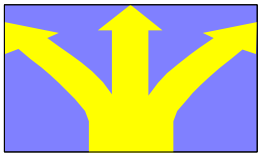
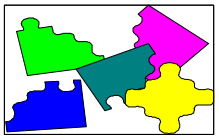


2 - transportation system

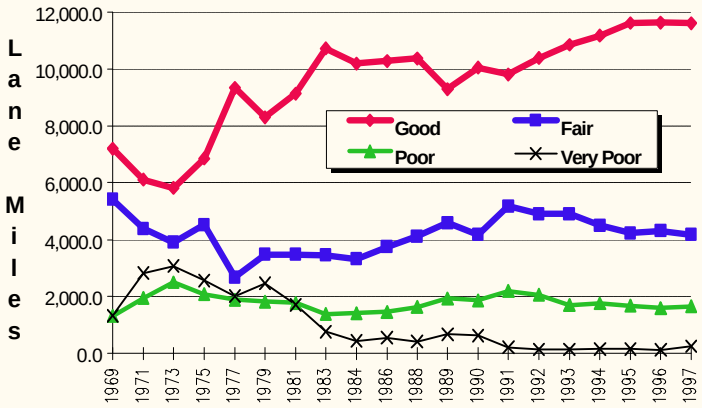


2-1 aging system

2-1 Pavement Condition

Fig. 24 *Pavement Structural Conditions*

State of Washington



Source: Materials Lab, WSDOT

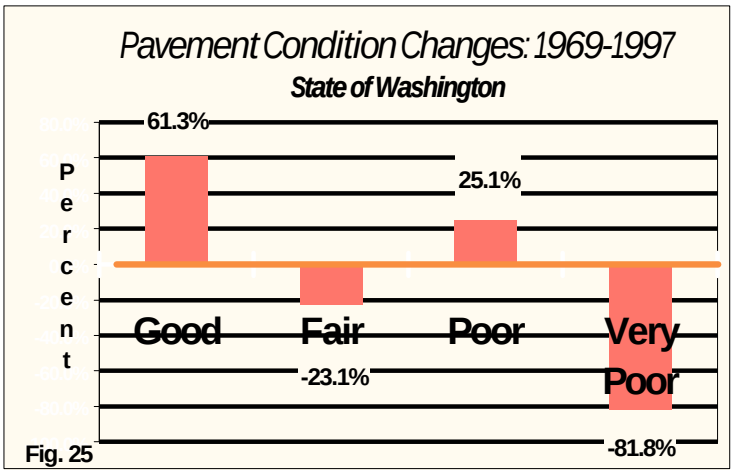


Fig. 25

Source: Materials Lab, WSDOT

The Pavement Structural Condition measures the surface condition with a value from 1 to 100.

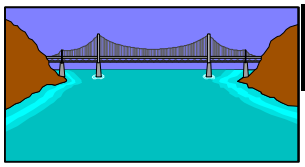
Good	75-100
Fair	50-75
Poor	25-50
Very Poor	0-25

TREND

Over a thirty year period since 1969, 4,410 miles of roadway statewide were brought up to a rating of "good." In 1969, we started with 7,200 lane miles of roadways rated "good," and by 1997, this figure rose to 11,610 miles. During this time, pavement rated "very poor" dropped from 1,315 miles to just 240 miles in 1997. This was accomplished by repairing damaged pavement segments and building more durable roads.

FUTURE

With the current pavement management program, a 61.3% increase in the number of roads were brought up to the standard of "good." This trend continues but with effort as more of the roadway system experiences wear and tear from greater use.



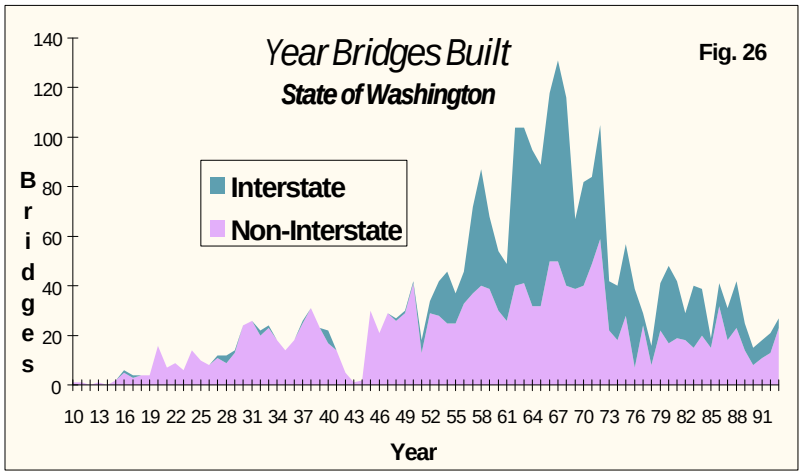
2-1 Bridge Condition

TREND

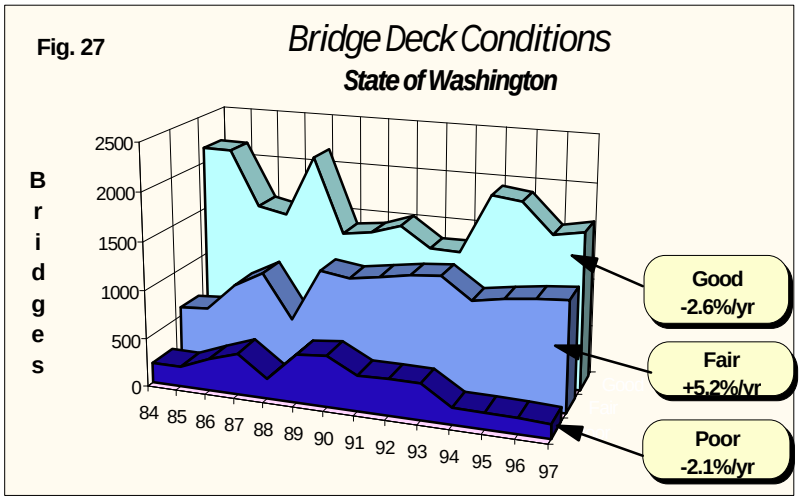
Washington's state highways are connected by a network of 2,917 bridges. The average age of these bridges is 34 years. Many of the bridges were overpasses constructed on the Interstate system, and were built between 1955 and 1975. In 1989, the FHWA Coding Guide was adopted resulting in better inspections and reporting. Better reporting to the Regional Offices meant repairs could be made in a more timely fashion. Over the period from 1984 to 1997, the number of bridges rated "poor" decreased from 208 to 148 which was a 29% drop. However, of the bridges remaining, problems associated with bridges rated "poor" are structural in nature, making repairs costly compared to repairs involving an overlay of asphalt or concrete.

FUTURE

Fewer bridges will be rated "good" as "good" bridges are downrated to "fair" over time. Repairs can raise the rating of "poor" bridges to fair but this change is more costly and slow.

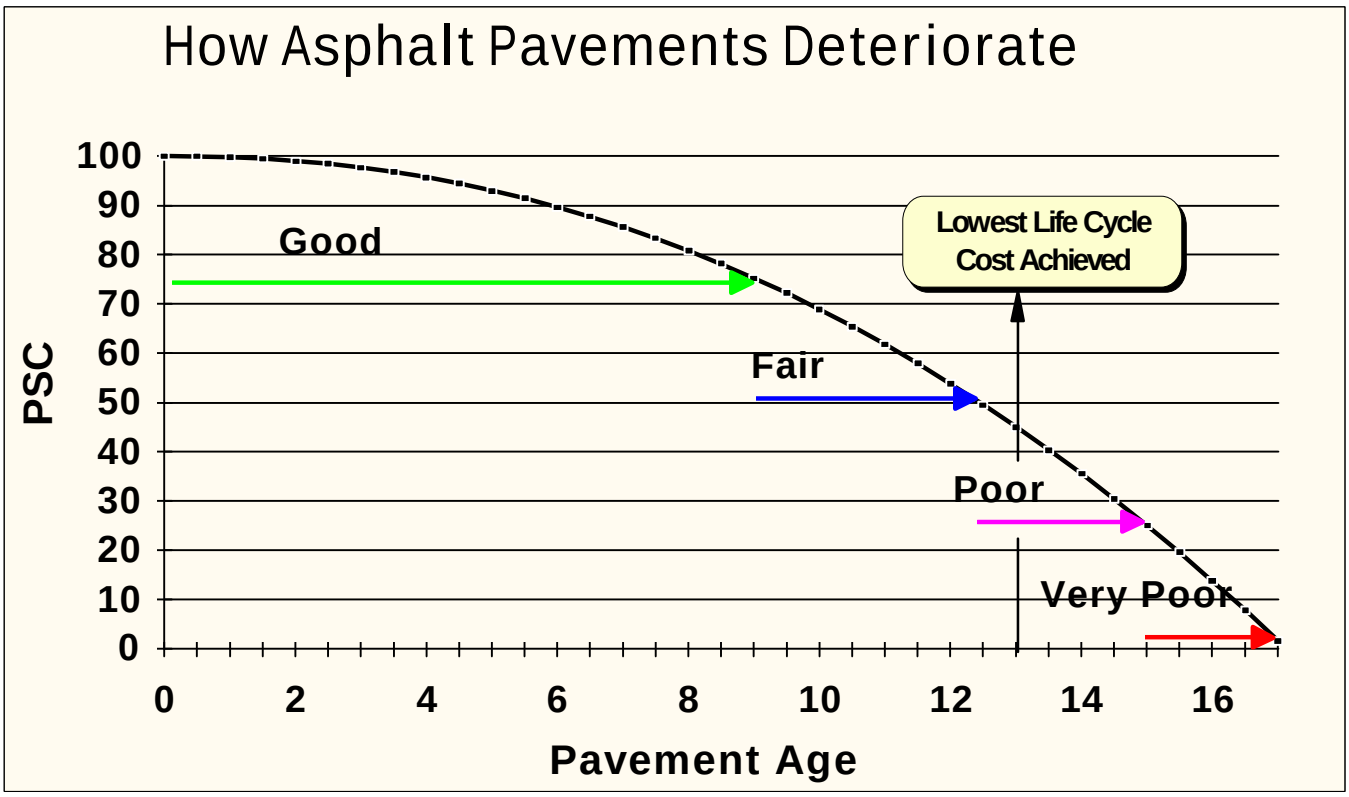


Source: Systems Planning Branch, WSDOT



Source: Bridge & Structures Office, WSDOT

2-1 Asphalt Pavement Deterioration



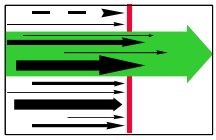
Source: Systems Planning Branch, WSDOT

TREND

The lowest life cycle cost is achieved at about 12 to 13 years in the life cycle of asphalt pavement. Maximum benefit is not achieved for work performed either before or after that time. The state is not yet at the lowest life cycle cost.

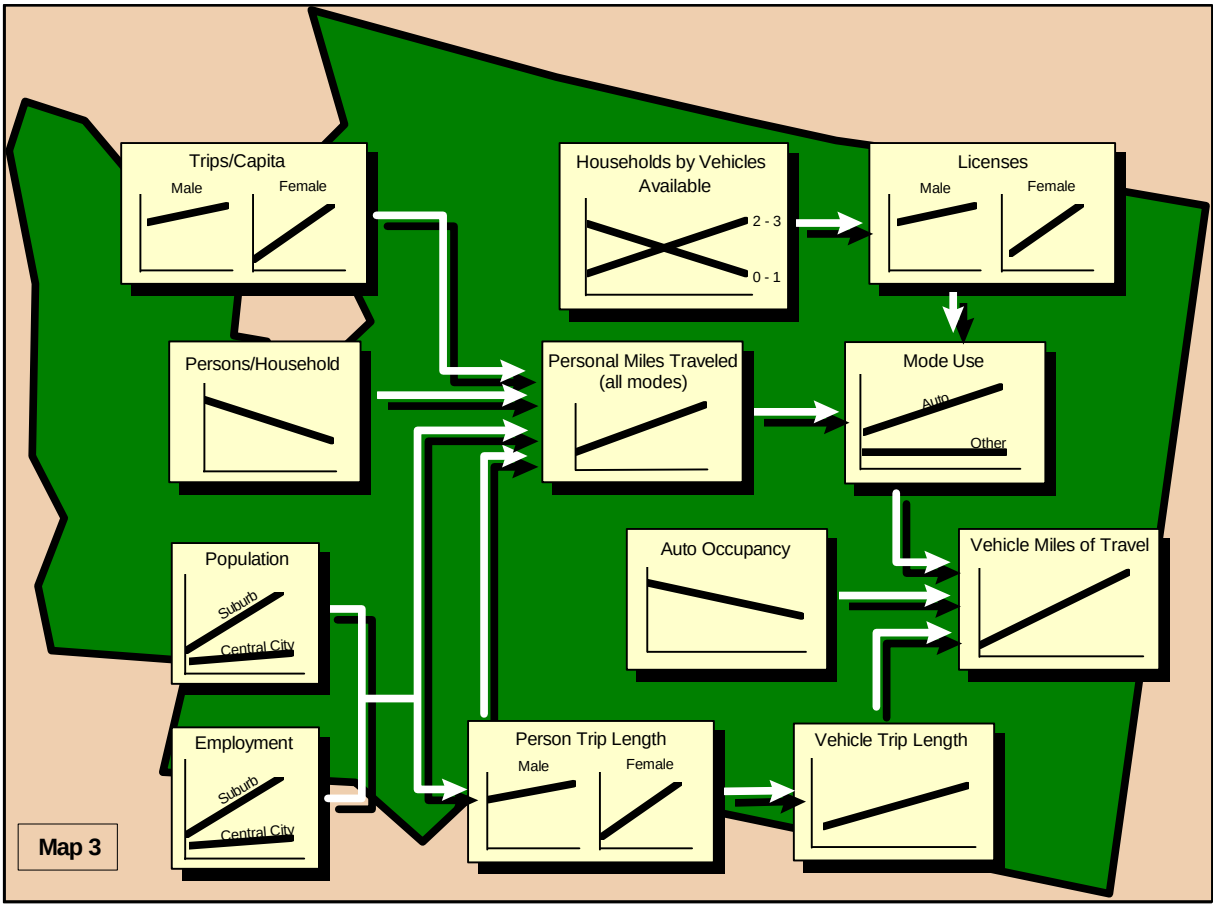
FUTURE

Over the next 14 years, the Pavement Preservation Program will seek to catch up and bring the highway system in line with the lowest life cycle cost schedule. Repairs will need to be made to roadways before deterioration reaches a stage that makes the repairs more costly.



2-2 travel growth

2-2 Factors Influencing Travel



Adapted from Michael D. Meyer

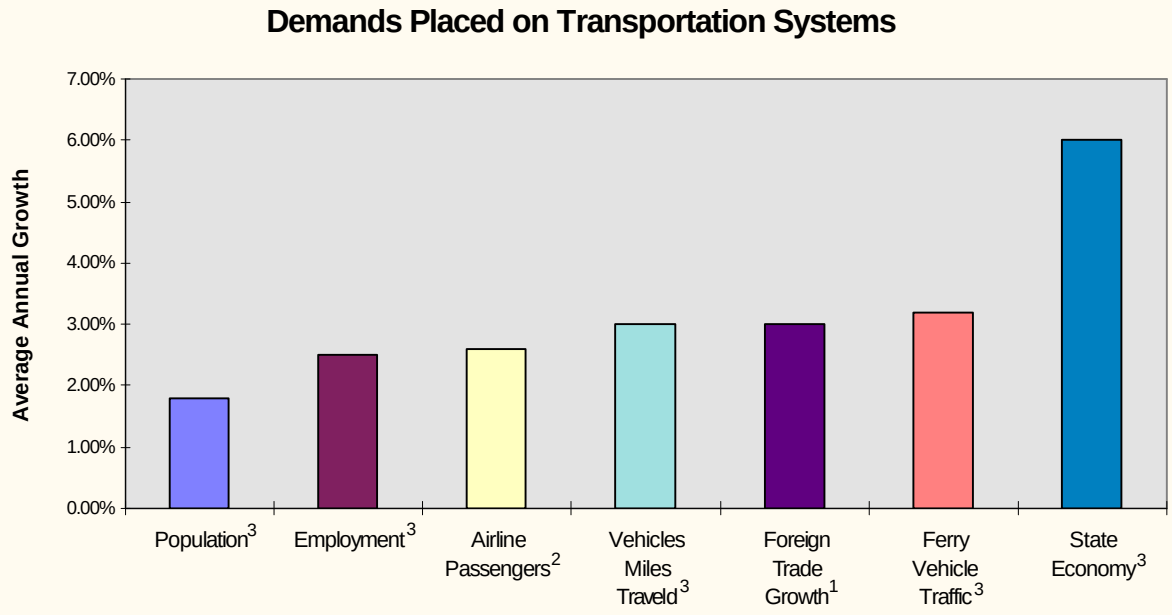
Over the past two decades, various factors have come to be considered critical in understanding how travel is influenced. As the state population grows and more businesses open their doors, a greater number of trips are made, more miles are traveled on the system, and congestion increases. The relationships of the factors that influence travel are shown above. These variables play an important role in explaining travel.

Demands Placed on Transportation Systems

Demands on the transportation system continue to grow. The growth of Washington State's economy is predicted to outpace national economic growth by 50 percent over the next 10 years.

Washington's population, growing at an average annual rate of almost 2 percent, is expected to exceed six million people by 2003. Along with population increases come increases in employment, miles traveled, and other traffic.

All of this growth places new demands on the state's transportation system.



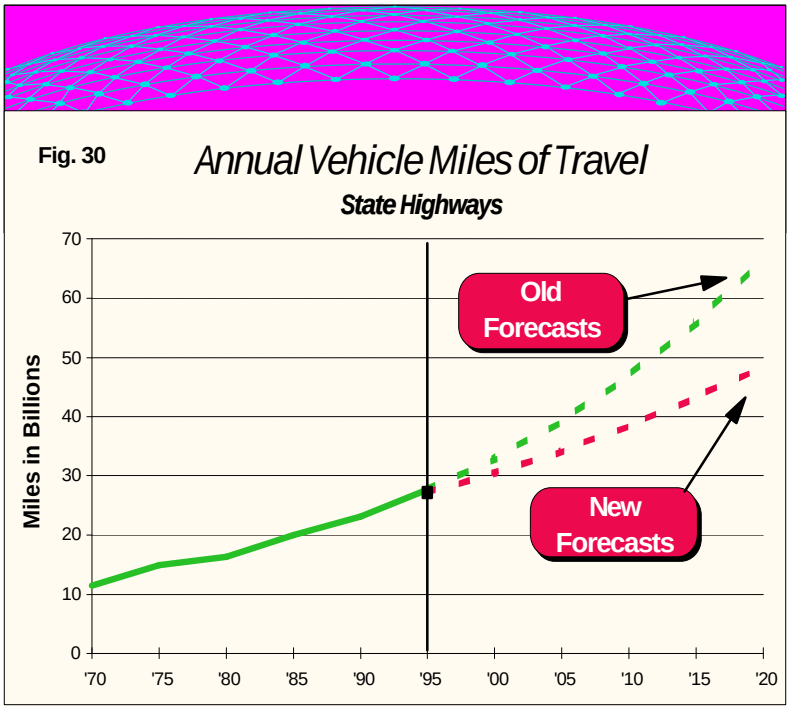
[1] Average Two Way Trade Growth 1986 - 1994

[2] Average growth 1993 to 2000

[3] Average growth 1991 to 2003

Fig. 29

2-2 The Future of Travel



Source: Transportation Planning Office, WSDOT

Annual vehicle miles traveled (VMT) is the number of miles traveled on roadways in one year. VMT is a measure of how much travel takes place on a roadway. The VMT provided in the chart is for **state highways.**

TREND

The growth in vehicle miles traveled on state highways annually (VMT), has risen 141.5% from an annual total of 11.4 billion vehicle miles traveled in 1970, to 27.6 miles billion vehicle miles traveled in 1995.

FUTURE

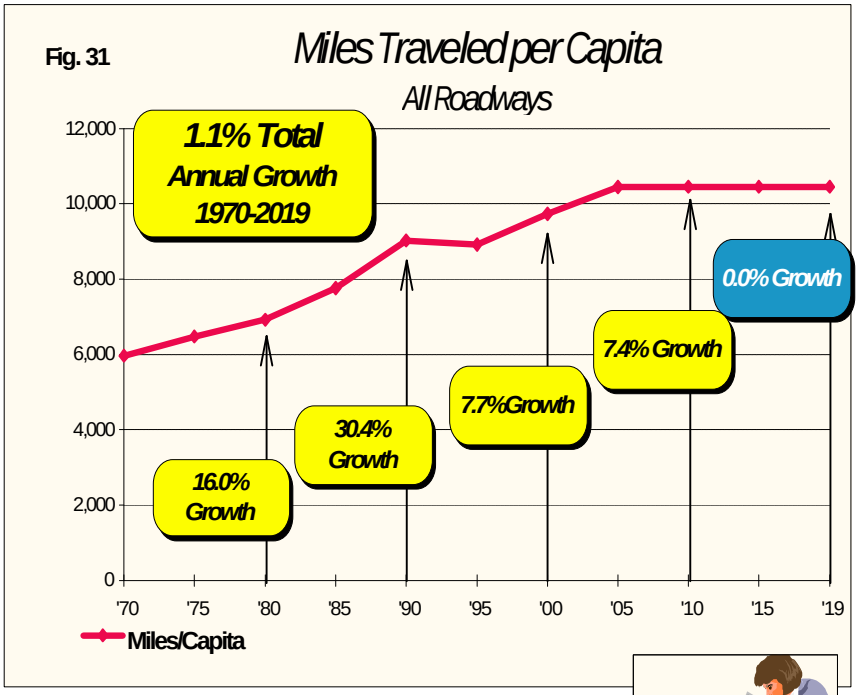
Although the old forecast indicates a 3.6% per year rate of growth from 1995 to 2020, the new forecast indicates a slower rate of growth of 2.4% per year for the same period. At the new forecasted rate, 48.5 billion miles will be traveled on the state's system each year compared to 66.7 billion miles following the old forecast. Still, the new forecast indicates a 79% growth in travel from 1995 to 2020. The slower rate of growth is accounted for by the following:

a) Vehicle availability reaching saturation
b) Congestion levels affecting trip lengths
c) Female drivers license and workforce participation peaking

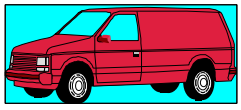
	'70	'75	'80	'85	'90	'95	'00	'05	'10	'15	'20
Old Forecast	11.43	14.94	16.3	19.91	23.12	27.6	32.9	39.3	46.9	55.9	**66.7**
New Forecast						27.1	30.4	34.2	38.4	43.18	**48.52**

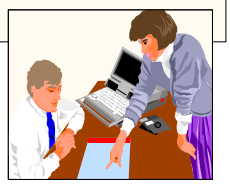
2-2 Miles Traveled per Capita

Fig. 31



Source: Economics Branch, WSDOT





TREND

The average number of miles traveled by each person has risen dramatically from 1970 to 1990. In 1970, miles per capita averaged 5,991 miles of travel per year on all roadways in the state. By 1980, miles per capita had risen 15.5% to 6,920 miles per year. In 1990, this figure jumped 30.5% to 9,027 miles per year. However, by the year 2000, miles per capita may start slowing down reaching 9,724 miles for a total increase of 7.7% over the decade of the 90's. Reasons for the slowing down may be attributed to the saturation of women entering the labor market, and also less willingness on the part of drivers in general to keep driving especially if congestion lengthens the duration of a trip while not adding more miles to the trip.

FUTURE

From 2010 to 2019, per capita miles traveled each year is expected to peak at around 10,448 miles. This represents a no growth rate scenario in per capita miles traveled for the decade. The reasons for this are tentatively based on the assumptions that individuals will decide not to spend any more time driving than they already are, and a peaking in the number of women entering the labor market. Trip distances may also start leveling off as home-job-retail activities become more local. Trip substitutions and transportation demand management strategies may also take effect. However, miles traveled per capita will still be the highest they have been in the state's history.

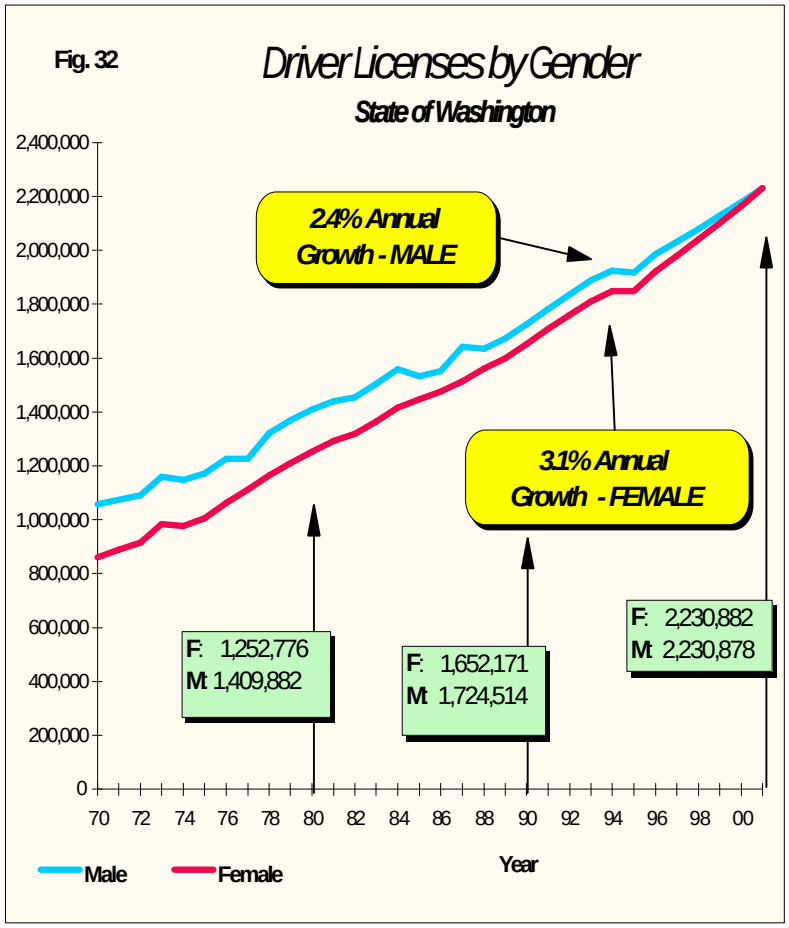
2-2 Miles Traveled per Capita

All Roadways

Table 3

Year	VMT billions	Population in millions	Miles / Capita	Change in miles
1970	20.37	3,413,244	**5,991**	-
1975	23.11	3,567,900	**6,476**	485
1980	28.60	4,132,156	**6,920**	444
1985	34.26	4,415,785	**7,759**	838
1990	43.93	4,866,692	**9,027**	1,269
1995	48.43	5,429,900	**8,919**	-108
2000	57.34	5,896,517	**9,724**	805
2005	66.10	6,330,505	**10,442**	717
2010	70.59	6,756,242	**10,448**	6
2015	75.25	7,202,793	**10,448**	0
2019	79.03	7,653,590	**10,448**	0
Total Growth	**387.9%**	**224.2%**	**174.4%**	

2-2 Driver Licenses by Gender



Source: Economics Branch, WSDOT

TREND

The split in driver licenses between men and women in 1970 was 55% and 45% respectively. This split continued to change through the 1980s when 53% of the drivers were men and 47% were women, but more women kept entering the workforce. In the decade of the 1990s, the percent of driver licenses held by men dropped again to 51% while the percent of licenses held by women increased to 49%. The faster rate of growth for women in gaining driver licenses (3% versus 2.3% for men) reflected the even balance taking place in the labor force for men and women.

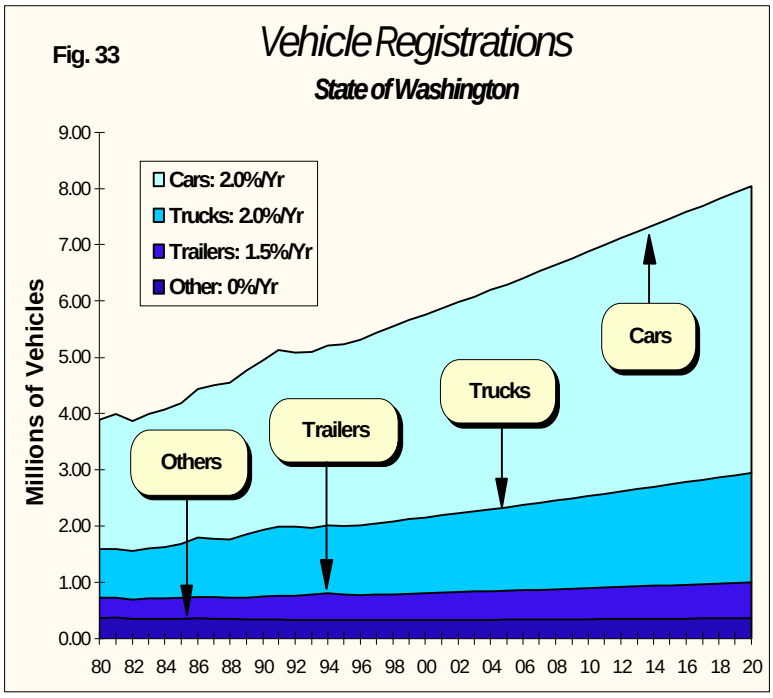
FUTURE

By 2001, the proportion of women and men drivers will be about equal. As female labor force participation reaches saturation, differences in travel patterns between men and women may also show as shorter trip distances with more trip chaining* for women.

* Trip chaining: a trip from point of origin to the final destination (one-way) linked by a number of modes or vehicles.

2-2 Vehicle Registrations

Fig. 33



Source: Economics Branch, WSDOT

TOTAL VEHICLE REGISTRATION
Average Annual Growth Rates

1.8%	1980 - 2020
2.0%	1980-1997
1.8%	1997-2020

TREND

From 1980 to 1997, vehicles were registered at a slightly faster rate than the growth in population. During this period, the population grew 1.8% a year while the number of cars and trucks registering increased 2.0% a year. In 1997, most of the vehicles registering (85.7%) were passenger cars and vans, pick-up trucks and sport-utility vehicles. The trend followed the upward growth in the population as well as the large number of women entering the workforce.

FUTURE

As in the past, the decision to buy a vehicle will be guided by personal necessity. Convenience, ease, safety, security, expense and the availability of workable, alternative options will still play a strong role in influencing decisions regarding trip modes. More vehicles will be registered reflecting growth in population and employment. However, the number of vehicles may start to reach saturation as the number of vehicles per household starts tapering off.

2-2 Commute Trip Patterns

TREND

In 1960, more people were riding in carpools, using transit and walking to work than they were 30 years later. Fewer people also drove to work by themselves in 1960 than in 1990. Since 1960, the number of lone drivers going to work increased 18.7%. While the actual number of commuters using transit increased, the percent of transit users went down slightly by 4.6%. The percent of commuters using carpools slipped 10.4%. Commute choices such as walking declined 3.5% as did the percent of individuals working at home which shifted downward 0.3%. SOVs* increased while all other methods of commuting showed a slow decline in total shares.

Jobs, housing and retail have tended to be dispersed over a wide area which necessitated longer trips and greater auto dependence. This travel pattern reflected the continued suburbanization of metropolitan areas.

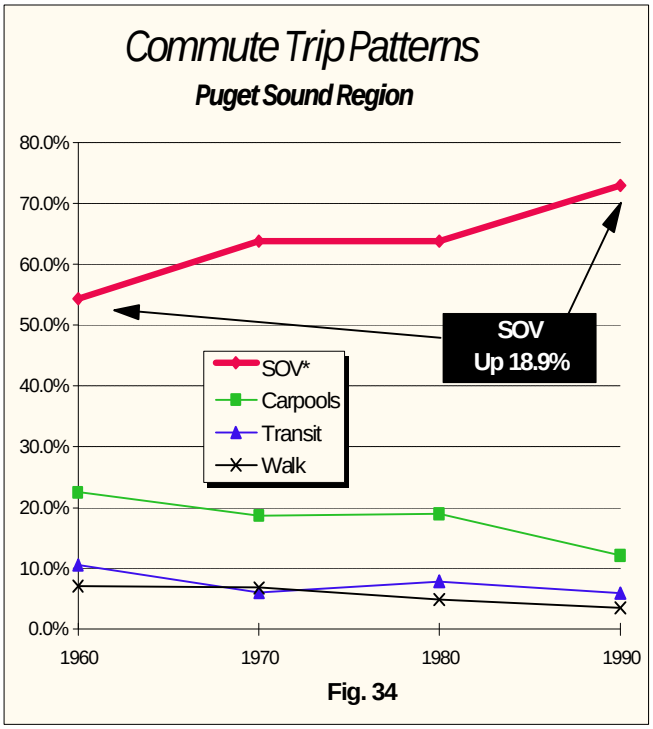


Fig. 34

Source: "Puget Sound Regional Journey to Work," Transportation Planning Office, WSDOT, based on 10 year census data.

*** SOV (Single Occupant Vehicle)**

FUTURE

Trends for the Puget Sound area show a 1% shift in mode choice from SOV to carpool by 2020. Expansion of Transportation Demand Management strategies (TDM) and Commute Trip Reduction programs will play a greater role. TDM includes transit incentives, Commute Trip Reduction, High Occupancy Vehicle lanes, Clean Air and Land Use (GMA), and congestion pricing options.

2-2 Commute Trip Reduction Impact

TREND

Fewer people were driving alone to worksites affected by the Commute Trip Reduction Law. The CTR Law applies in counties with a population over 150,000. Nine counties are presently affected. There are 895 CTR affected worksites involving 340,000 employees (15% of the total workforce in the 9 counties). At the CTR worksites, more people walk / bike, ride the bus and carpool now than they did in 1993, and fewer people drive alone to work. The share of SOV* commute trips dropped 4% from 1993 to 1995 and all other commute options gained shares of the total commute trips. Through 1995, the CTR program increased the capacity of the transportation system by 12,000 daily vehicle trips or 300,000 daily vehicle miles.

*** SOV (Single Occupant Vehicle)**

FUTURE

CTR programs will continue to slow the growth of congestion though not eliminate it even if future trip reduction targets are met. The CTR target is to reduce SOVs and vehicle miles traveled by 35% of 1993 levels for these variables. The positive trend is likely to continue and then level off as the impact of the program is absorbed at CTR affected worksites.

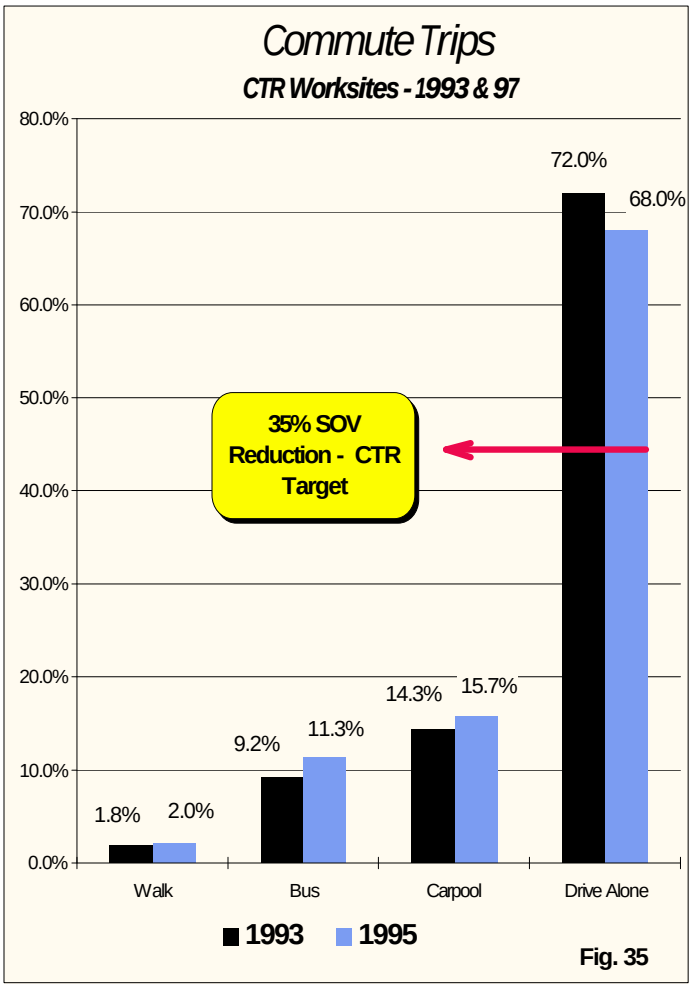


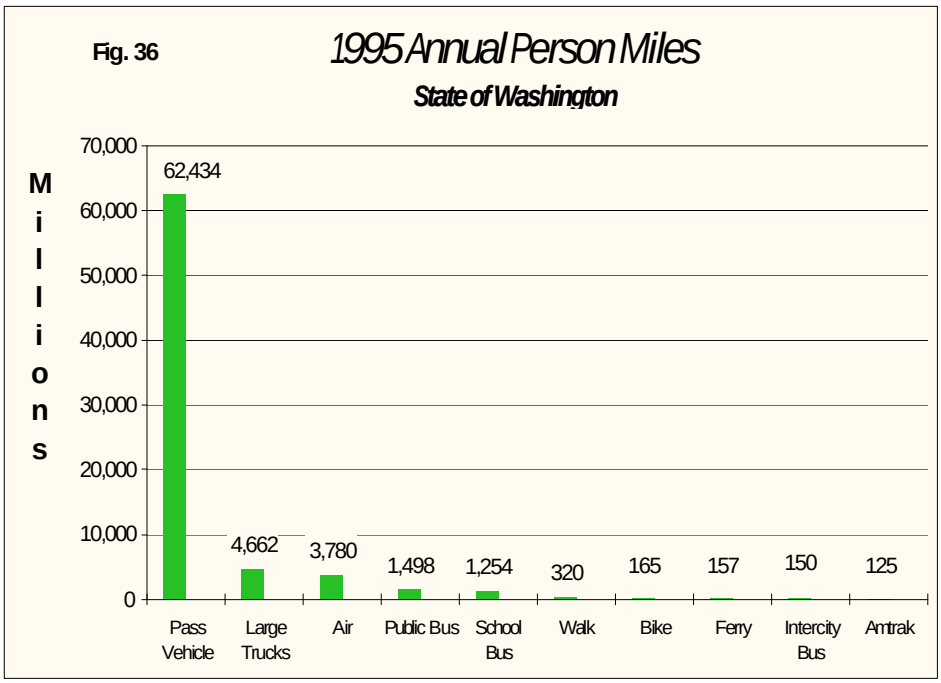
Fig. 35

Source: "Impacts of the Commute Trip Reduction Law - as reported to the CTR Task Force on 11/14/97."

2-2 Annual Person Miles by Mode

1995 Person Miles in millions - TABLE 4		
Pass Vehicle	62,434.0	**83.75%**
Large Trucks	4,662.0	**6.25%**
Air	3780	**5.07%**
Public Bus	1498	**2.01%**
School Bus	1254	**1.68%**
Walk	320.4	**0.43%**
Bike	165.0	**0.22%**
Ferry	157.3	**0.21%**
Intercity Bus	150	**0.20%**
Amtrak	125.0	**0.17%**
Total	74,545.7	**100.00%**

Fig. 36



Source: Transportation Planning Office

TREND

Annual person miles statewide shows that the dominant mode of travel is the automobile. This is particularly the case in suburban and rural areas of the state where the choice of modes is limited mostly to cars. Increases in truck person miles took place due in part to some losses of rail line, and also the greater flexibility of trucks in delivering and shipping goods.

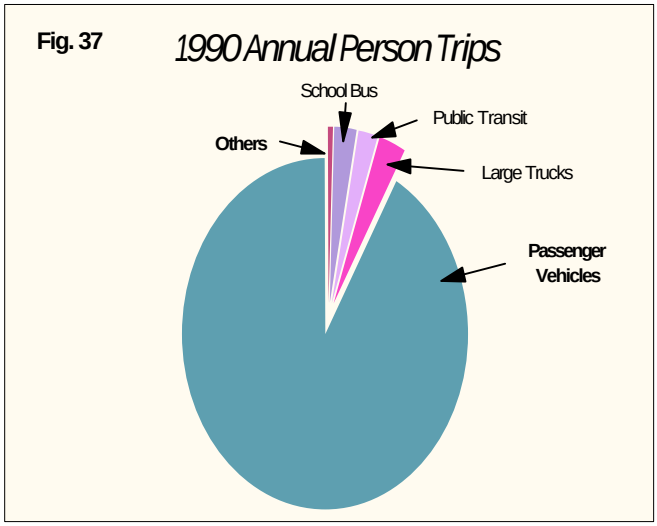
FUTURE

Due to congestion, shifts will be seen from cars to public transportation which includes buses, intercity passenger rail and light rail. Though the volume of the shift can be expected to be significant, trends in travel behavior indicate that the total share of person miles by public transportation will remain relatively small compared to automobiles as it has in the past.

2-2 Annual Person Trips by Mode

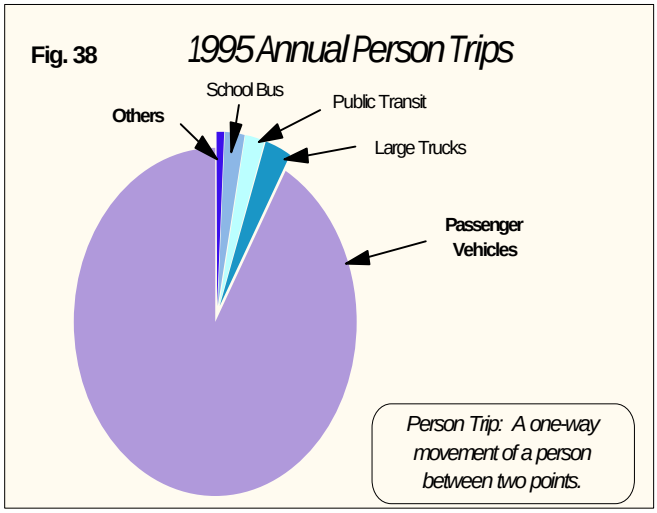
1990 Annual Person Trips in millions - Table 5a		
Pass Vehicles	5,651.8	91.60%
Large Trucks	194.0	3.14%
Public Transit	139.6	2.26%
School Bus	143.3	2.32%
Others *	41.3	0.67%
Total	6,170.0	100.00%
* Others		
Air	17.8	0.29%
Ferry	21.4	0.35%
Intercity Bus	1.5	0.02%
Amtrak	0.6	0.01%

Fig. 37



1995 Annual Person Trips in millions - Table 5b			'90-'95 Growth/yr
Pass Vehicles	6,572.0	91.61%	3.06%
Large Trucks	233.1	3.25%	3.74%
Public Transit	149.8	2.09%	1.42%
School Bus	167.2	2.33%	3.13%
Others *	51.9	0.72%	4.68%
Total	7,174.0	100.00%	3.06%
* Others			
Air	25.2	0.35%	7.20%
Ferry	24.2	0.34%	2.49%
Intercity Bus	1.5	0.02%	0.00%
Amtrak	1.0	0.01%	10.76%

Fig. 38



2-2 Annual Person Trips by Mode - Percents

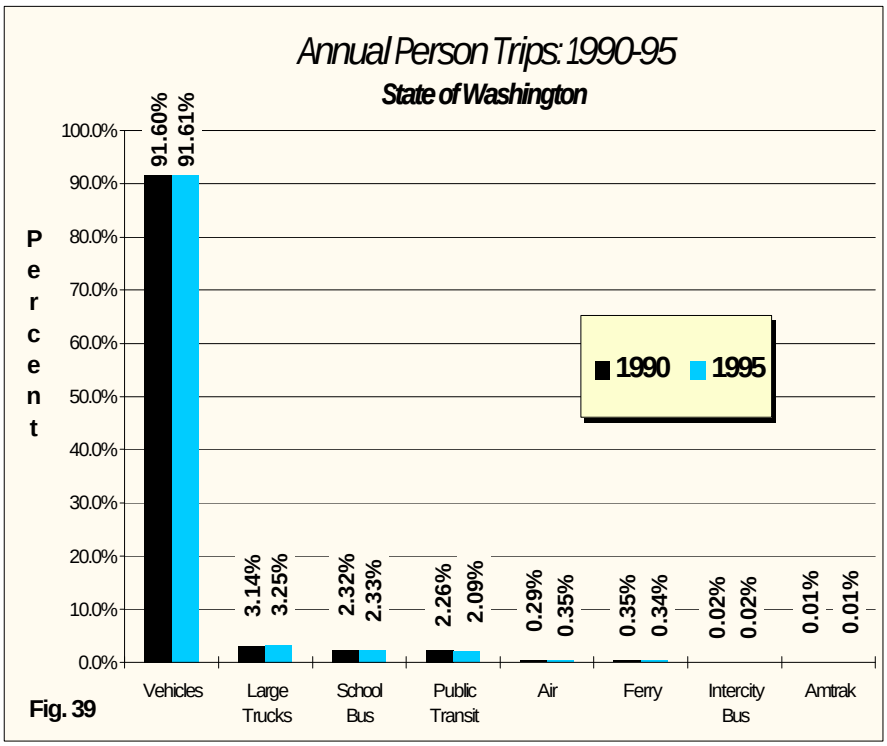


Fig. 39

TREND

Statewide, **92%** of all trips were made using a personal vehicle. The remaining 8% of trips were made using large trucks, public transit, school buses, intercity bus/charters, air and ferries. These percentages of trips held pretty firmly throughout the five year period between 1990 and 1995.

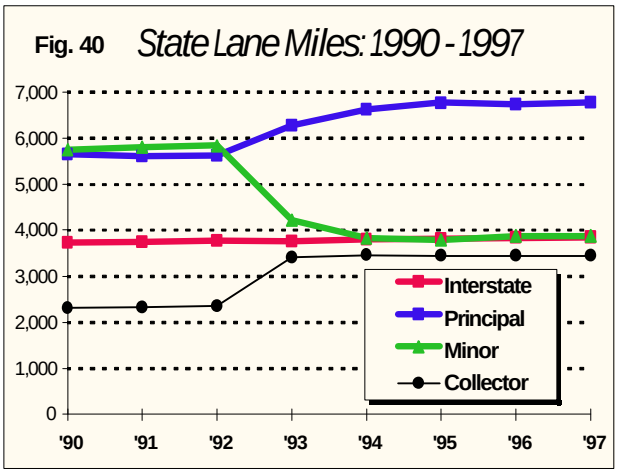
Sources: Key Facts 1995, WSDOT; 1996 Traffic Collisions in Washington State, WTSC; Airport Activities Statistics, FAA, 1992; 1990 & 1995 Public Transportation Summary

FUTURE

More trips using **all** modes of travel were taken in 1995 than in 1990 - about 16% more. However, most people (91.6%) chose their personal vehicles for short and even longer trips. Car travel is expected to be the dominant mode of travel. Two trends in particular show increases in travel overall: total vehicle miles traveled and miles traveled per capita. Statewide, about **8%** of all trips are split among modes other than the auto.

2-2 Highway Capacity

Fig. 40 *State Lane Miles: 1990 - 1997*



Source: TRIPS System, State Mainline Highway and Lane Miles, State of Washington, Department of Transportation

State Highway Centerline Miles
1925 - 1994

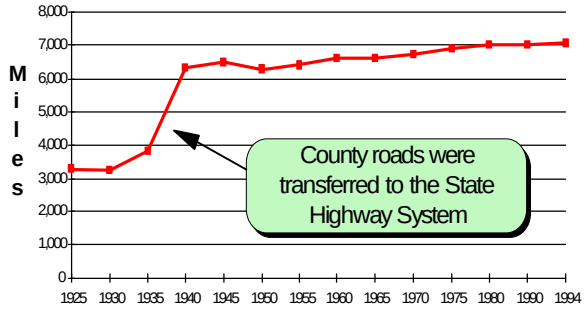


Fig. 41

Source: TRIPS System, State Mainline Highway and Lane Miles, State of Washington, Department of Transportation

TREND

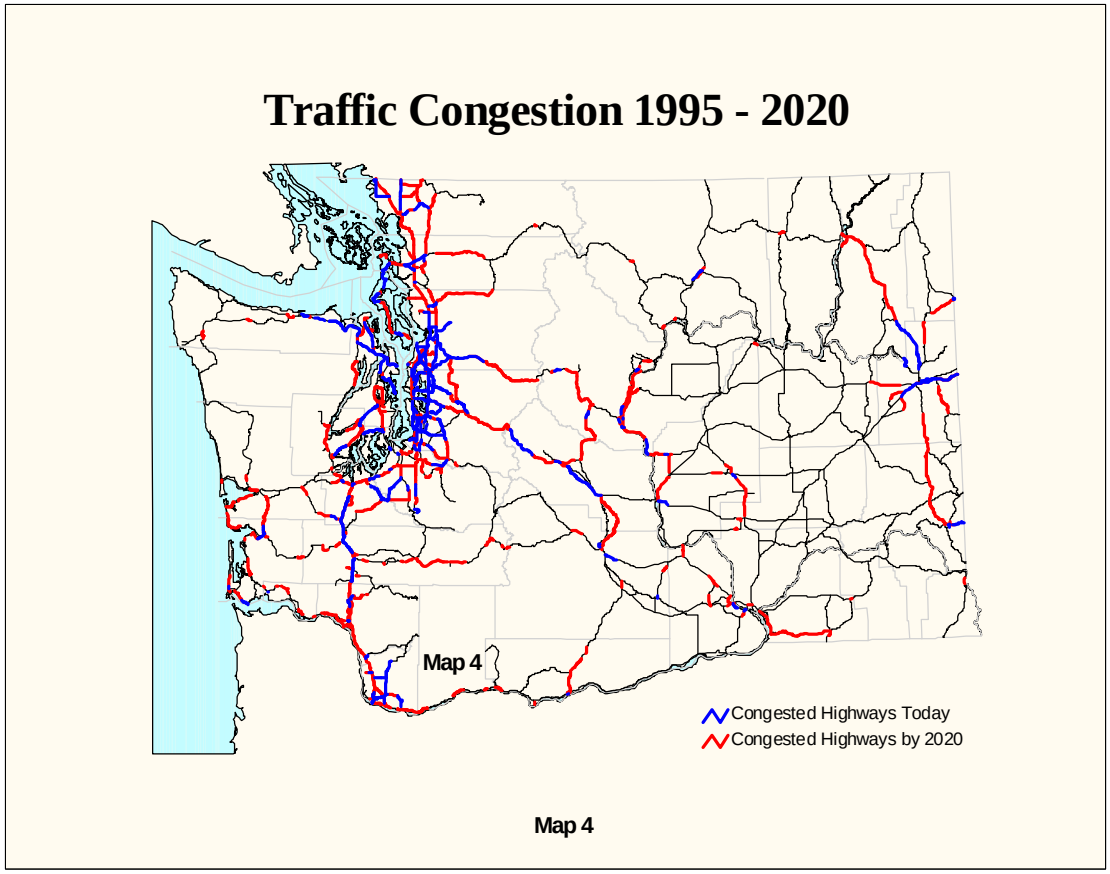
The lanes of roadway in the state are measured in **lane miles.** The total number of lane miles for all roads in 1997 was 17,960 miles. Total lane miles increased 497 miles from 1990 to 1997. This 2.8 % increase is relatively small and has taken place mostly in the form of road widening - a strategy to increase flow and efficiency on our roads. State highway **centerline miles** are equivalent to miles of roadway which are two or more lanes. From 1980 to the present, centerline miles have remained fairly constant at 7,000 miles. This means that rather than adding new roadways, new lanes to existing roadways were added.

Note: The legislature defines the routes of the state highway system. Periodically, routes are added or removed. Miles of minor arterial routes have decreased because of a change in the functional classification of routes in 1993 due to ISTEA when some of the minor routes became principal arterials.

FUTURE

About 800 million miles of travel per year will be added to the system from 1995 to 2020. To meet this demand, some lane miles will need to be added to the system by widening existing highways. In rural areas, uncongested conditions on rural highways will need to be maintained. However, attention will focus on the application of transportation system management strategies to encourage greater efficiency in the use of the highway system.

2-2 Traffic Congestion Map



Map 4

* **LOS C:** A condition of stable flow in which the volume and density levels are beginning to restrict drivers in their freedon to select speed, change lanes or pass.

LOS D: A condition approaching unstable flow in which tolerable average operating speeds are maintained but are subject to sudden variations.

TREND

Highways segments that are congested today are below Level of Service (LOS) thresholds. The LOS standard on HOV and rural highways is "C." On urban highways LOS "D" is the threshold.*

FUTURE

Blue lines indicate highway segments below LOS thresholds. Red lines indicate highway segments that are predicted will be below LOS thresholds by 2020.

2-2 Highway Congestion

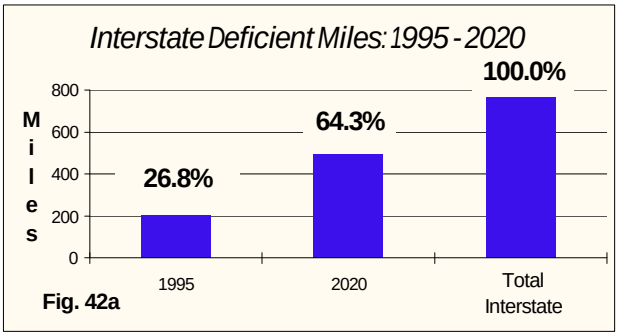


Fig. 42a

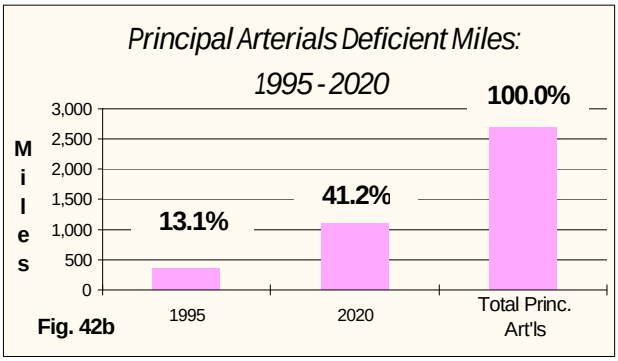


Fig. 42b

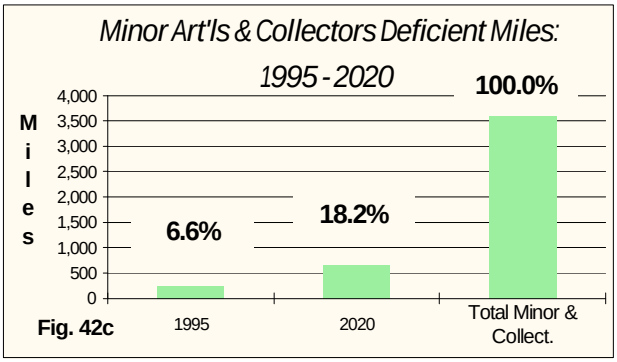


Fig. 42c

TREND

The impact of congestion is seen in the growing number of roadway miles that have become deficient or unable to accommodate an acceptable flow of traffic. For the Interstate highway system, 205 miles were congersted in 1995 which was 26.8% of the total interstate system in the state. Principal arterials were congested along 325.5 miles or 13.1% of this category of roadway in 1995. Minor arterials and collectors experienced congestion on 6.6% or 237 miles of this category of roadways. In total, 11.3% or 7,037 miles of roadways in all categories were congested in 1995.

FUTURE

By 2020, congestion will affect one-third (32.3%) or 2,249 miles of roadway in these categories statewide, i.e., interstate, principal arterials and minor arterials / collectors. The Interstate system will experience congestion along 491 miles of a system comprising 764 miles. This amounts to 64.3% of the total Interstate system within the state. Principal arterials will experience congestion along 1,106 miles or 41.2% of a system that consists of 2,682 miles of principal arterials. Minor arterials and collectors will be affected along 652 miles or 18.2% of the total system of minor arterials and collectors. The state's population and economic growth will continue to encourage increases in vehicle miles of travel. Modal shifts may take place to some extent with expansions in transit and rail service, and trip substitutions may be made, but these effects will be small compared to the growth of auto vmt (vehicle miles traveled).

2-2 Highway Congestion

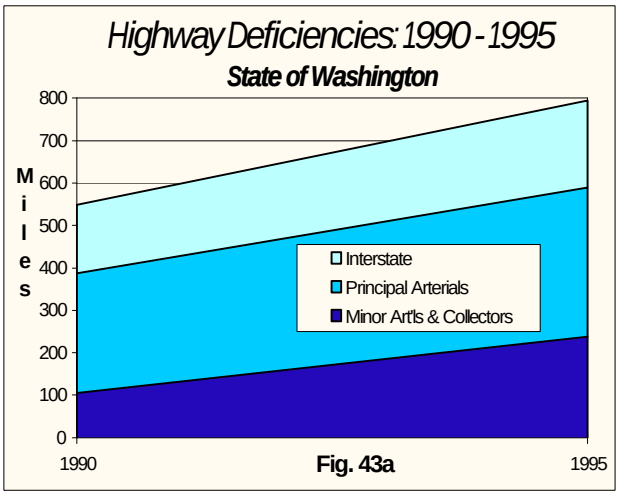


Fig. 43a

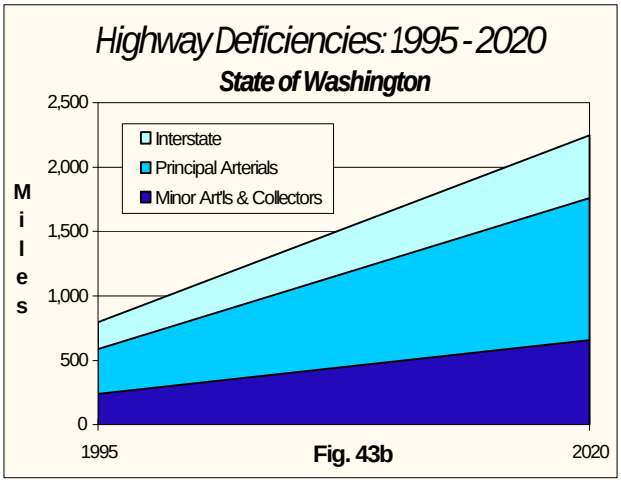


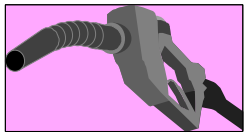
Fig. 43b

Source: 1995 V/C File, Transportation Planning Office, Department of Transportation, State of Washington

TREND

In 1990, 548 miles of roadway statewide were affected with slowdowns due to congestion. By 1995, 795 miles of roadways were congested statewide. The increases in these miles of congested roadways were seen for highway and roadway categories shown. On urban roadways, drivers on affected portions were traveling below the speed limit. In rural areas, on deficient portions of the highway, drivers were operating at a lower than posted speed.

Note: Deficiency in urban areas means below a Level of Service "D." In rural areas, miles deficient means movement falls below a Level of Service "C." See page 34 for LOS definitions.



FUTURE

With no improvements beyond the 1995 level, deficiencies will take place at the levels shown. Deficient miles of highways will continue to rise for all types of roadways due to greater congestion. More miles traveled by more people means the buildup of congestion will outpace the current level of funding improvements. If revenues follow the historical trend, only 24% of congestion-related needs would be met. Some lanes will be added, the HOV system completed, and TDM strategies applied when possible. These measures will slow the increase of deficient highway miles somewhat, but congestion will increase at or above levels being experienced in many U.S. cities.

2-2 Public Transportation Capacity

TREND

The number of people making trips using public transportation increased 36.9% from 1988 to 1996. This was a gain of 40.9 million trips per year from 110.7 million in 1988 to 151.6 million in 1996. Although most trips were short, the average distance of a trip has been increasing. Contributing to the growth trend, longer cross-county and express routes were added, service areas restructured, and vehicles replaced with modern comfortable coaches and vans.

FUTURE

More residents live within the boundaries of a public transit provider than ever before (86% in 1996 compared with 82% in 1992). Large and small urbanized areas responded positively to both fixed route and demand-responsive services, but growth in service and ridership in rural areas was greater. In large and small urban areas, the trend is toward longer trip distances. This trend is likely to continue due to greater demand for intercity travel. Growth in rural ridership is also likely to continue.

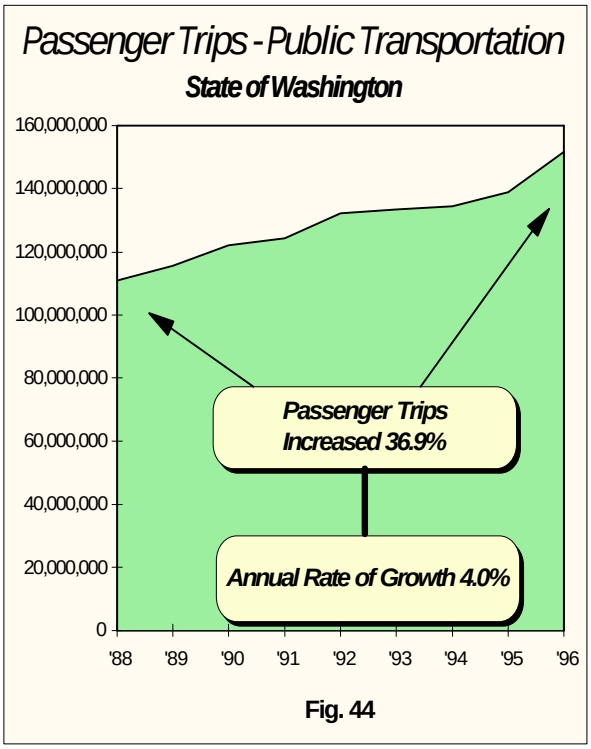


Fig. 44

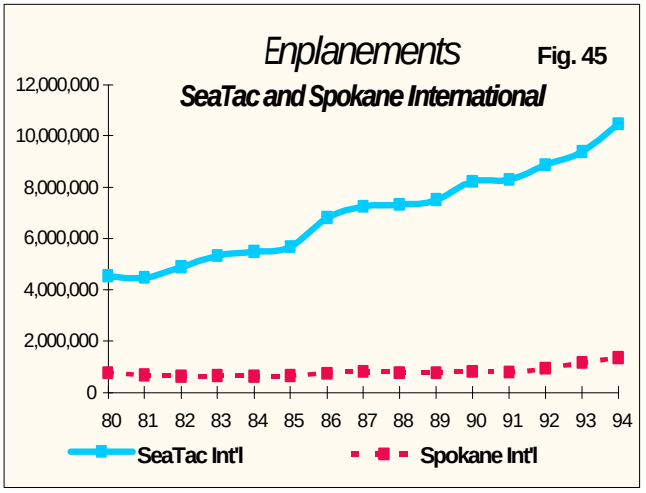
Sources:"1991 and 1996 Summary, Public Transportation Systems in Washington State," Washington State Department of Transportation, Sep 1992 and 1997

2-2 Aviation Capacity

TREND

Four and a half million people traveled through SeaTac International Airport in 1980. Fourteen years later, 10.5 million people traveled through the airport. Ridership had more than doubled. During the same 14 year period from 1984 to 1994, the number of travelers through Spokane Airport went from 635,313 to 1.3 million.

Regional Airports such as Bellingham have shown a startling rate of growth from 3000 passengers in 1980 to 109,000 in 1990. Pangborn Field (Wenatchee) has experienced a tripling in ridership from 11,300 to 33,300 in ten years. In the Tri-Cities, ridership remained high at 153,296 in 1990.

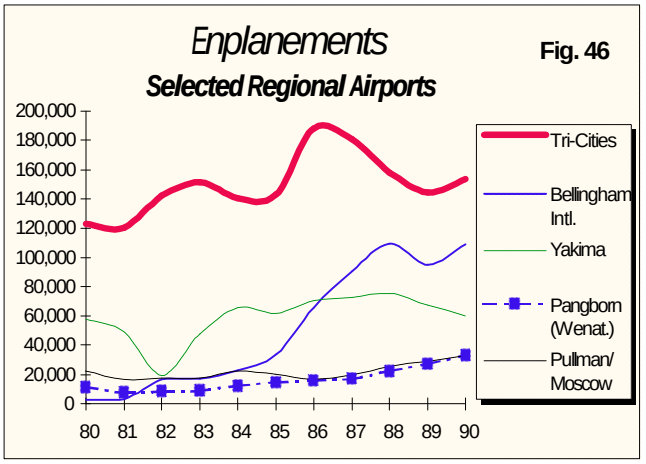


Source: 1994 SeaTac Airport Activity Report, 1993 WSCASP, Volume 1, page 93-95.

FUTURE

Recent forecasts call for a 57% increase in enplaned passengers at SeaTac by 2010.

A Master Plan Update for SeaTac Airport shows the need to address poor weather operating capability through the development of a third parallel runway and other facilities. A continued increase is also likely for Spokane. More travelers were using Regional airports as well and these trends follow a stronger economy in all areas of the state.



Source: 1994 SeaTac Airport Activity Report, 1993 WSCASP, Volume 1, page 93-95.

2-2 Ferry System Capacity

TREND

Passenger ridership grew 37% from 1980 to 1996. In 1996, 13.9 million people rode on the ferry system compared to 10.1 million in 1980. This same period also witnessed a dramatic growth in vehicle travel of 63%. In 1996, 10.8 million vehicles were transported on the ferry system compared with 6.6 million in 1980.

FUTURE *

Ferry system growth has been increasing at 3.1% per year for vehicles and 2.0% per year for passengers. Demand is pushing ahead of service capacity. To increase service capacity, the ferry system will accommodate more pedestrians, bicycles and registered HOVs on every sailing. Daily freight traffic will also be accommodated on each route. Passenger-only ferry service will be increased to reduce vehicle travel to urban centers. Continued growth will call for greater efficiency resulting in more service, but will be limited by system capacity.

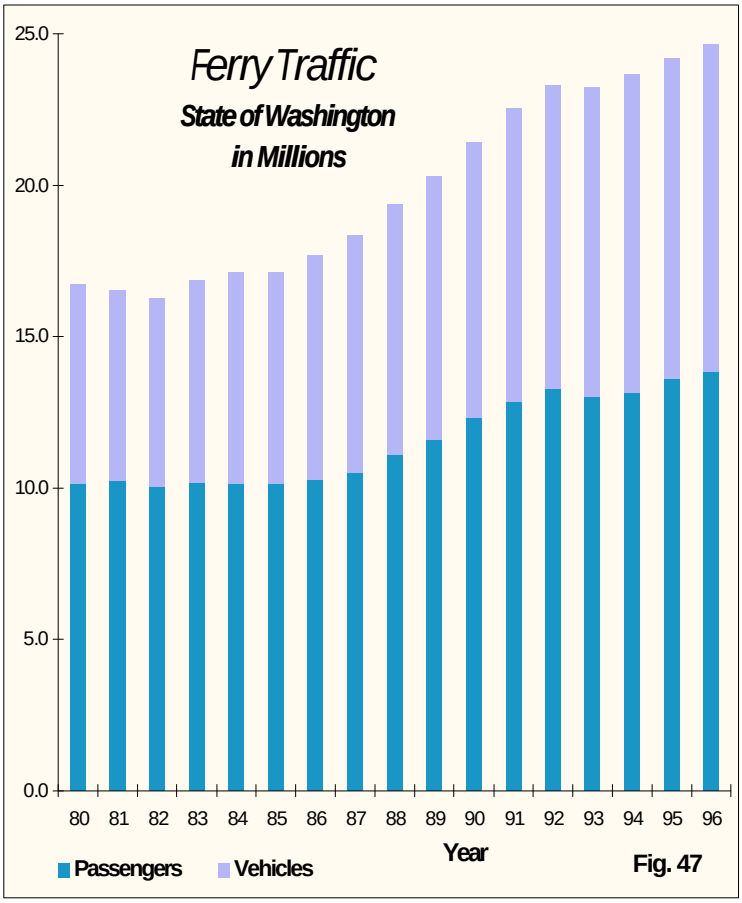


Fig. 47

Source: Washington State Ferry System

* Dataset to chart forecast not available.

2-2 Weekday Ferry Congestion

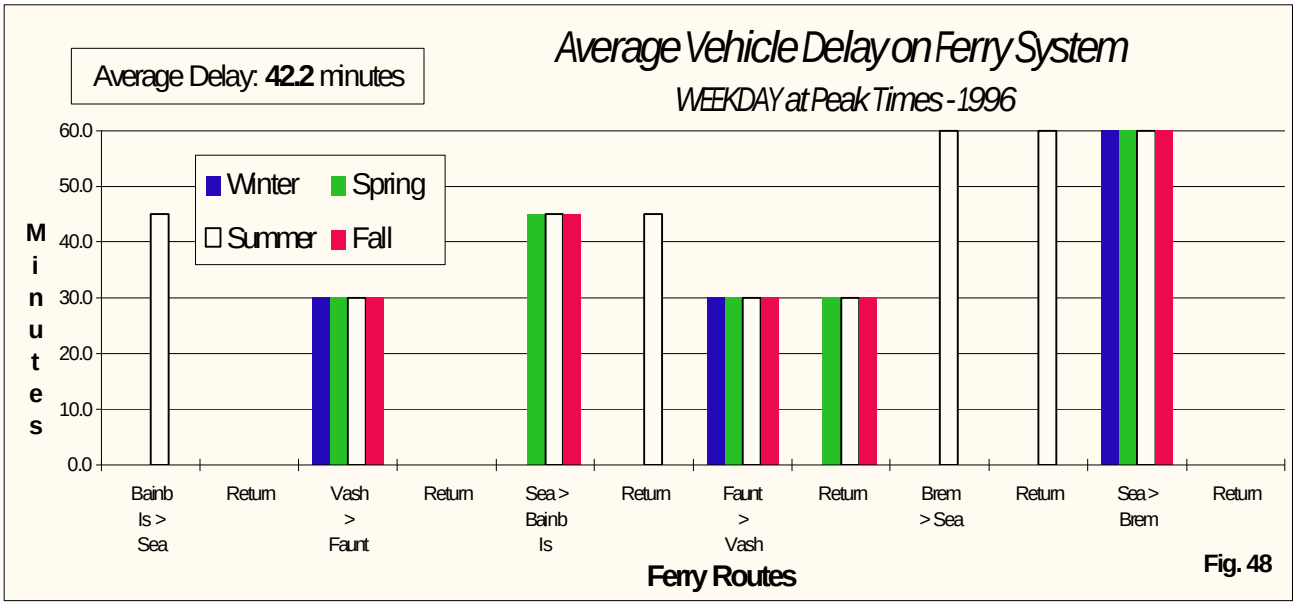


Fig. 48

Source: Measuring Ferry Service, Washington State Ferries. "Boat delay" measure was converted into actual waiting time.

TREND

The delay value is the number of minutes of delay before a vehicle waiting in line can board a ferry. The delay reflects the extra wait time that a typical patron experiences during peak travel times on weekdays. From 1980 to 1996, passenger ridership grew 37% , and vehicle travel increased 63%. In 1996, 13.9 million people rode on the ferry system, and 10.8 million vehicles were transported. In 1996, the average delay in vehicle boarding on weekdays was 42.2 minutes.

FUTURE

As ferry system demand rises, weekday delays during peak travel times will increase. To accommodate travelers, ferry system fleet will be sized so that pedestrians, bicycles and registered HOVs will receive consideration on every sailing. Passenger-only ferry service will be increased to reduce vehicle travel to urban centers.

2-2 Weekend Ferry Congestion

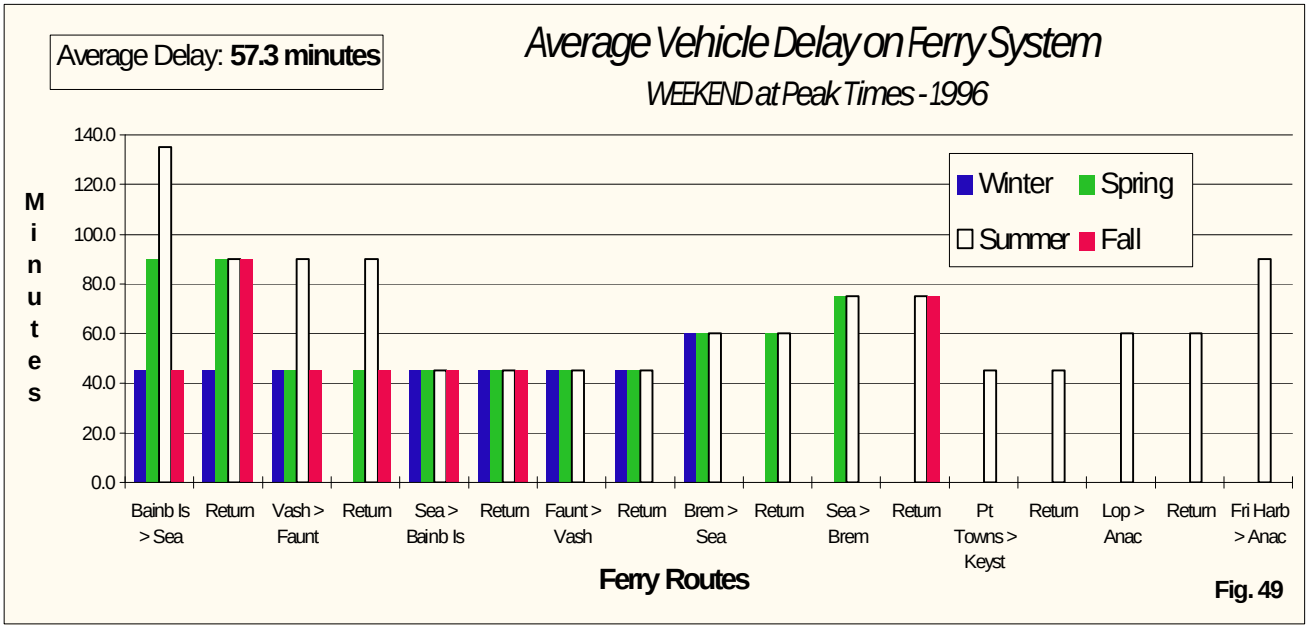


Fig. 49

Source: Measuring Ferry Service, Washington State Ferries. "Boat delay" measure was converted into actual waiting time.

TREND

Recreational travel peaks on weekends. As a result, delays on weekends tend to be longer than delays encountered during peak travel times on weekdays. The average peak hour delay on weekdays is 42.2 minutes. On weekends, this average is 57.3 minutes.

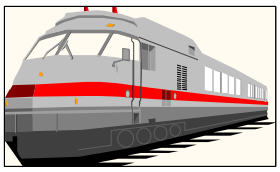
FUTURE

Weekend delays during peak travel times will increase as ferry traffic demand rises. The ferry system fleet will give consideration to pedestrians, bicycles and registered HOVs on every sailing to maximize ridership. Passenger-only ferry routes and service will increase and are likely to expand service into the weekend as is currently being done. These measures will slow delays for autos somewhat, but the magnitude of the demand will also spread peak travel times.

2-2 Intercity Rail Passenger Capacity

TREND

The popularity of intercity rail passenger service has grown tremendously averaging 23% per year from 1993 when the state sponsored service went into operation. In 1996, 198,480 more travelers rode the train than in 1993. This represents a very small percentage (.01%) of the total person trips for all modes. However, the successful acceptance of the trains shows traveler interest in having transportation options.



FUTURE

Amtrak ridership in the Pacific Northwest corridor jumped in 1994 with the addition of the Mt. Adams train serving Seattle and Portland. Ridership in the corridor increased again with the addition of the Mt. Baker train serving Seattle and Vancouver, B.C. Over the next 15 years, scheduled running times will drop by 30% in the corridor to attract greater ridership. Throughout the next 20 years, WSDOT plans to improve rail services and further develop multimodal stations. The "Pacific Northwest Rail Corridor Passenger Plan" is expected. Light rail will also be instituted as RTA gears up and becomes operational. Rail passenger's modal share may remain close to current levels, but with person trips increasing across all modes, the volume of rail passenger trip counts will continue to increase.

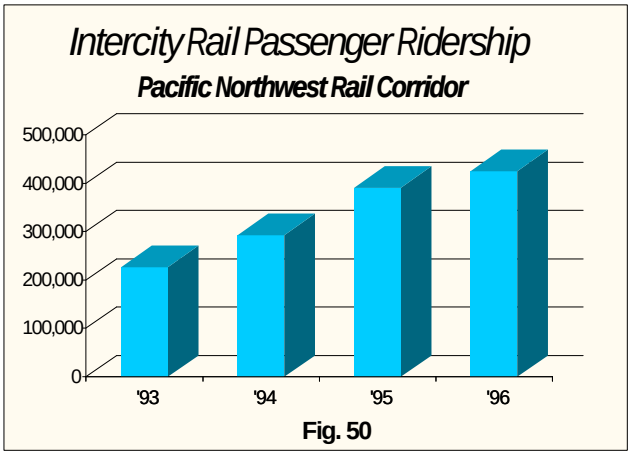


Fig. 50

Source: "Pacific Northwest Rail Corridor - 1996 Ridership Comparison Sheet," Rail Branch, WSDOT, 1997

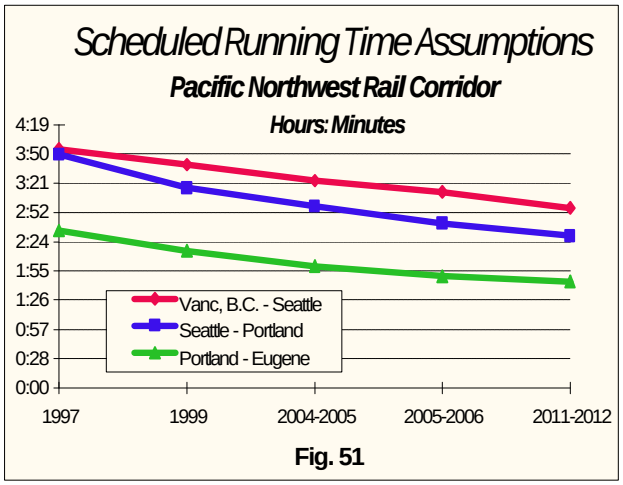
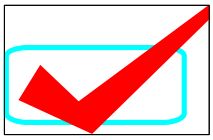


Fig. 51

Source: "Public Transportation & Intercity Rail Passenger Plan for Washington State 1997-2016," WSDOT, 1997



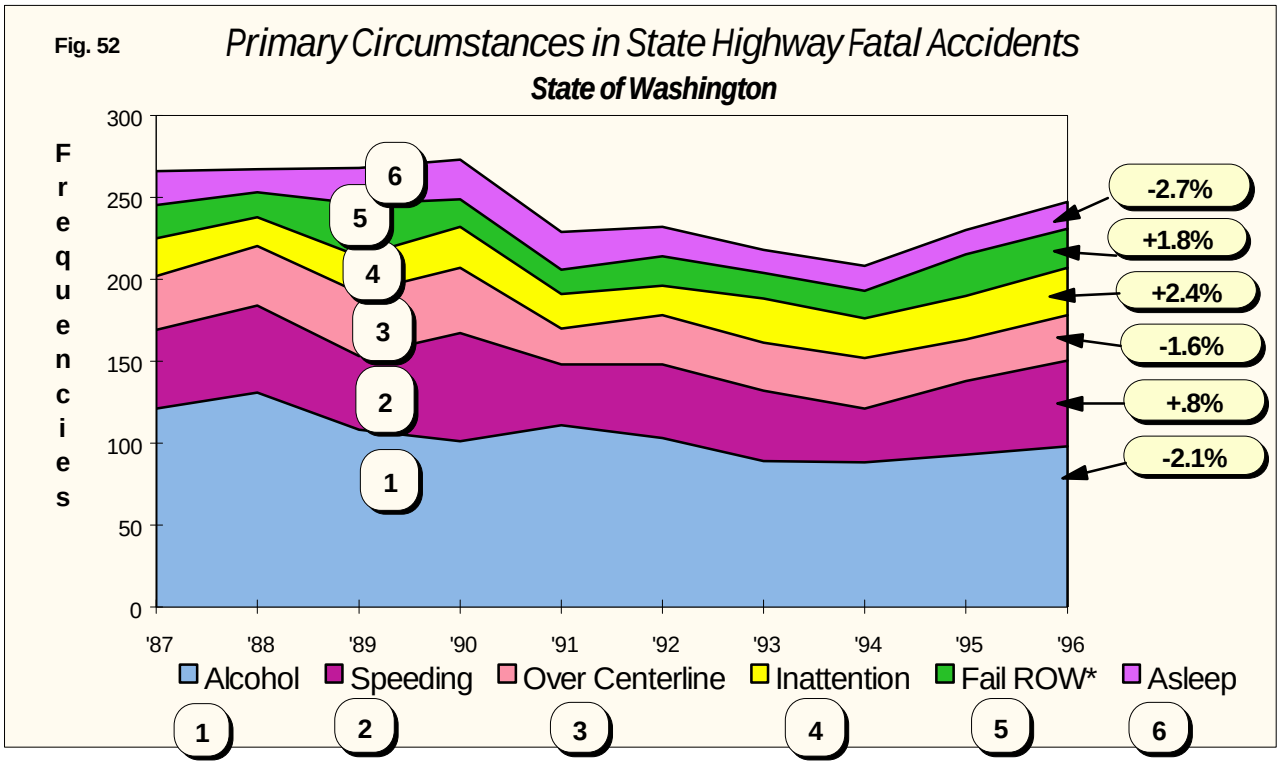
2-3 travel safety

2-3 Primary Causes of Fatal Accidents

Fig. 52

Primary Circumstances in State Highway Fatal Accidents

State of Washington



Source: Traffic Data Office, WSDOT

* Failure to Yield Right of Way

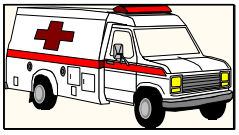
TREND

Fatal accidents have been in decline. Significantly, alcohol-related fatalities have been falling over the past decade from 1987 to 1996.

FUTURE

Fatal accidents in general will continue to go down. Stricter enforcement of drunk driving laws, greater seat belt use and safer vehicles will contribute to decreases in alcohol-related fatal accidents.

2-3 Highway Safety - Fatalities



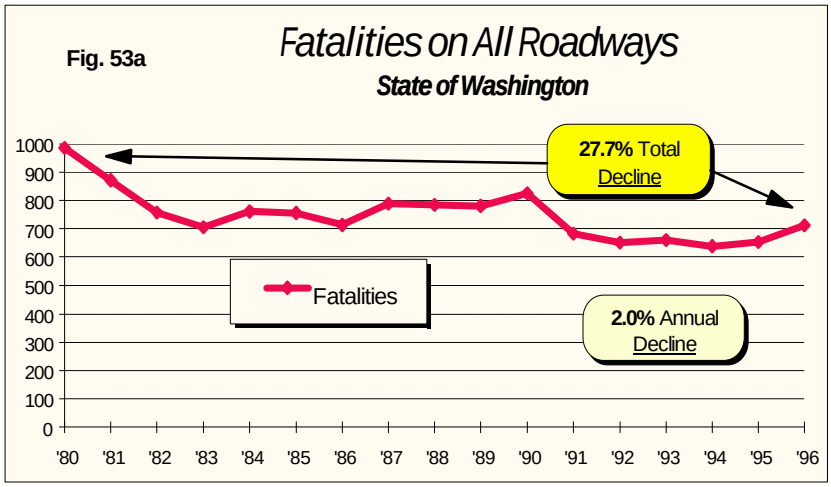
TREND

The number of fatalities declined 27.7% overall from 1980 to 1996. In 1980, 927 fatalities occurred and in 1996, the number of fatalities dropped to 712. This is an annual decline of 2.0%. Even with more miles being traveled each year in Washington, the number of fatalities on all roadways went down. The fatality rate dropped from 3.43 to 1.45 fatalities per 100 million miles of travel. The chance of being involved in a fatal accident in our state has been steadily going down.

FUTURE

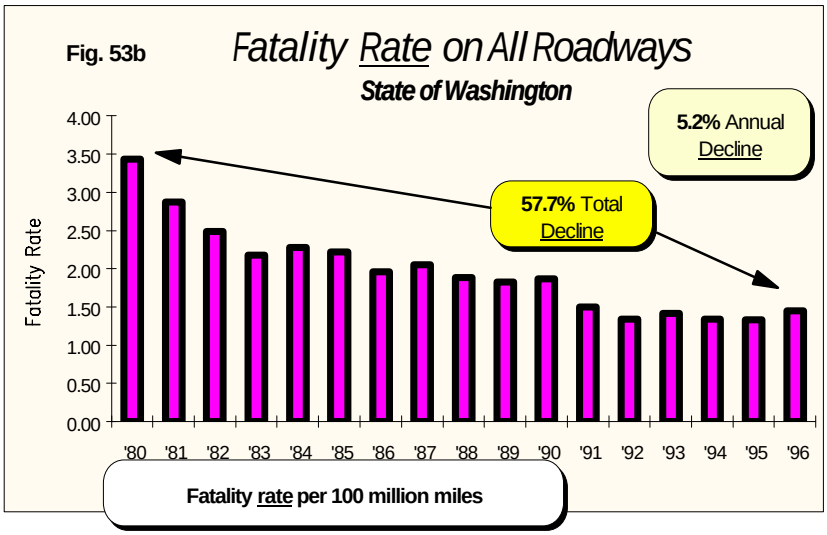
The chances of being in a fatal accident will continue to decrease especially with continued focus on highway seat belt use, safer vehicles, stricter enforcement of drunk driving laws, and improvement in the design of roadside features such as guardrails and sign supports.

Fig. 53a

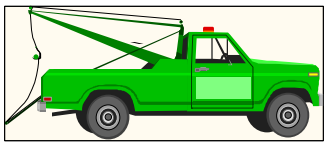


Source: "1996 Traffic Collisions in Washington State," Washington Traffic Safety Commission, September 1997.

Fig. 53b

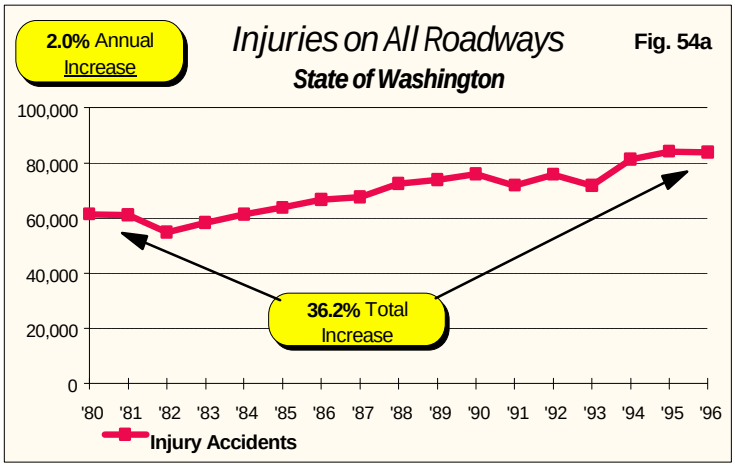


2-3 Highway Safety - Injuries



TREND

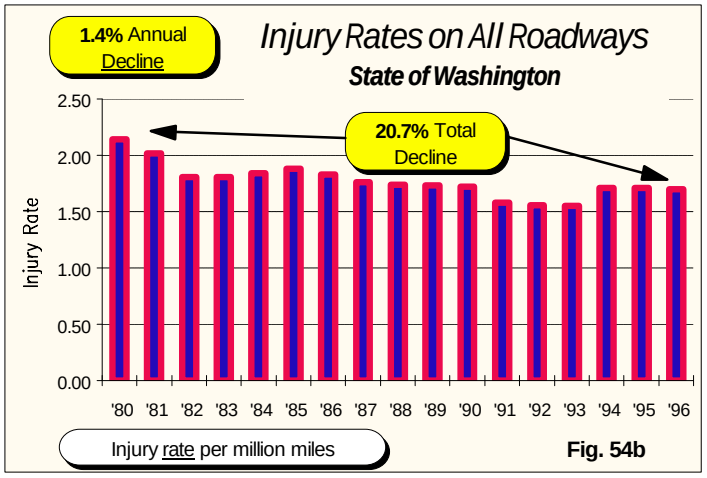
The actual number of injury accidents have increased from 61,632 in 1980 to 83,781 in 1996. However, the injury rate dropped because more total miles were driven on roadways in the state. For this reason, the chance of being in an injury collision on our roadway system actually declined from 2.14 injuries per million miles of travel in 1980 to 1.70 injuries per million miles in 1996. This is a rate of decline of 1.4% annually.



Source: "1996 Traffic Collision in Washington State,"
Washington Traffic Safety Commission, September 1997

FUTURE

Chances are improving that accidents that occur will be non-fatal. Highway safety continues to improve due to greater seat belt use, safer vehicles, stricter enforcement of drunk driving laws, and improvement in design of roadside features such as guardrails and sign posts. The number of injuries will continue to climb slowly. This rate is 2.0% annually (see Fig.54). However, the number of injuries per million miles of travel will continue to move downward but more slowly. With the number of miles traveled increasing robustly, focus on highway safety improvements and enforcement may still influence a downward trend.

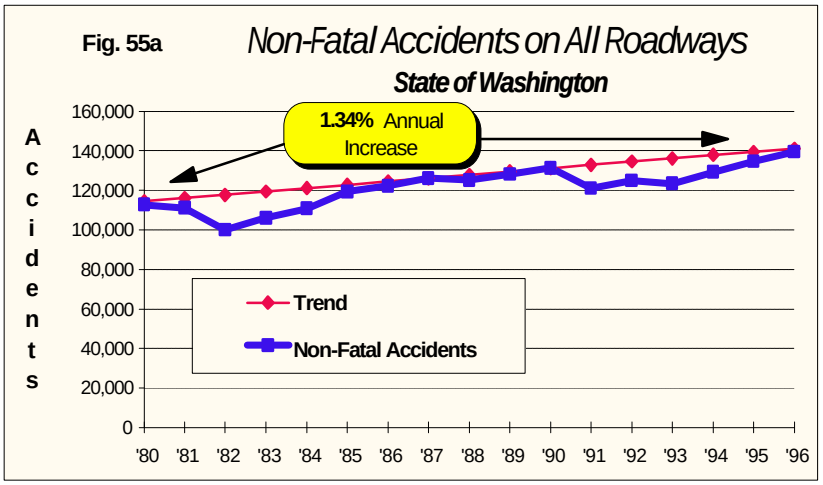


2-3 Highways Safety - Non-Fatal Accidents

TREND

Non-fatal accidents increased at 1.34% per year from 1980 to 1996. In 1980, there were 112,766 non-fatal accidents compared to 134,503 in 1996. The non-fatal accident rate per million miles of travel continued to slip downward at 2.0% per year. In 1980, this rate was 3.93 non-fatal accidents per million miles of travel compared to 2.83 in 1996. This trend indicates that fewer of the accidents taking place are fatal.

Fig. 55a *Non-Fatal Accidents on All Roadways*

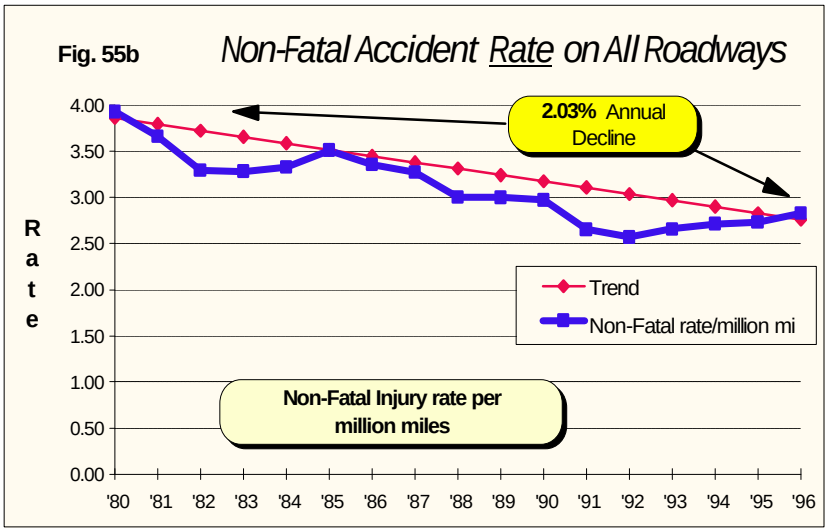


Source: "1996 Traffic Collision in Washington State,"
Washington Traffic Safety Commission, September 1997

FUTURE

Although the number of non-fatal accidents will continue to increase, this increase is offset by the greater number of miles traveled on our roadways. When vehicle miles traveled are considered against the number of non-fatal accidents that occurred, the resulting rate per million miles of travel indicates a downward trend. This trend toward greater safety on our roadways can be expected to continue.

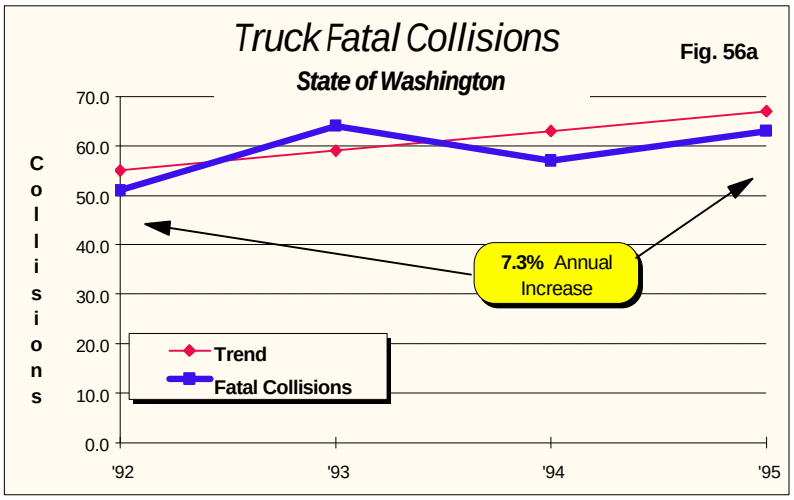
Fig. 55b *Non-Fatal Accident Rate on All Roadways*



2-3 Large Trucks - Safety - Fatalities

TREND

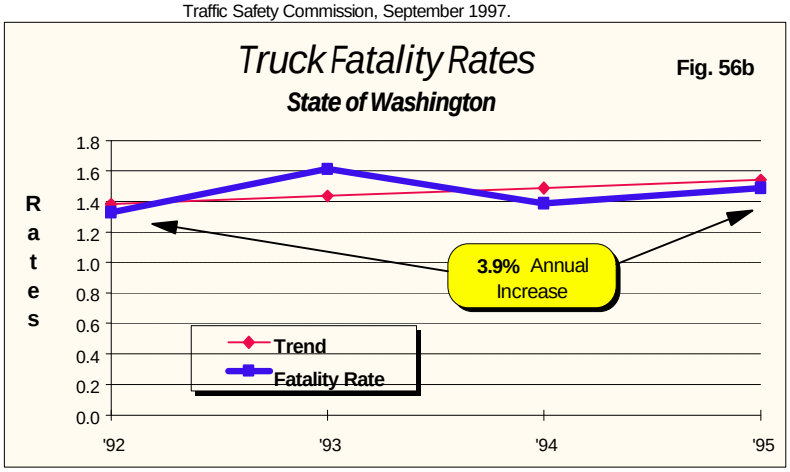
Fatal collisions involving large trucks increased slightly from 1992 to 1995. In 1992, there were 51 fatal accidents involving trucks. In 1995, the number increased to 63 fatalities. The fatality rate measures the number of fatalities per 100 million miles of truck travel. Using this rate, there were 1.5 fatalities per 100 million miles of truck travel in 1995 compared to 1.35 fatalities per 100 million miles of truck travel in 1992.



Source: "Washington State Reportable Motor Vehicle Traffic Collision Statistics, WSP; & 1996 Traffic Collisions in Washington State, Washington Traffic Safety Commission, September 1997.

FUTURE

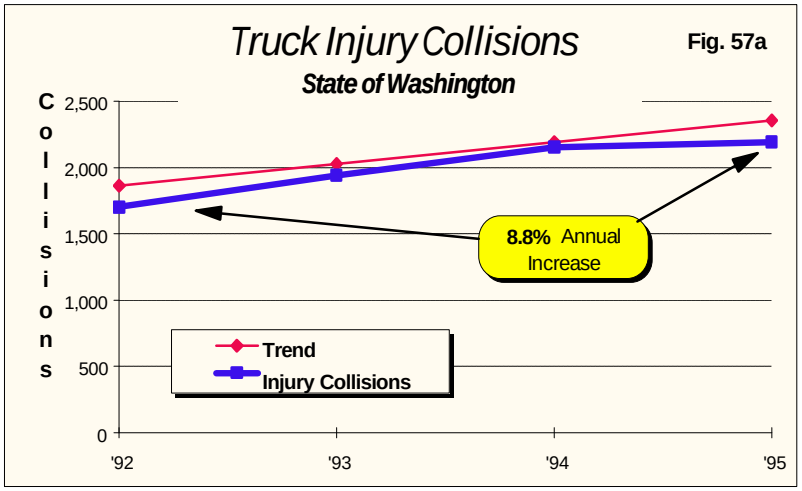
As more vehicles enter the highway and roadway system, it must be remembered that trucks cannot stop or turn as quickly as smaller vehicles. With increased congestion and lower speeds, truck fatalities may continue downward. However, truck injury collisions are likely to continue upward. Historically, from 1989 to 1995, fatal truck collisions were actually decreasing 3.7% per year, or from 79 fatalities in 1989 down to 63 fatalities in 1995.



2-3 Large Trucks - Safety - Injuries

TREND

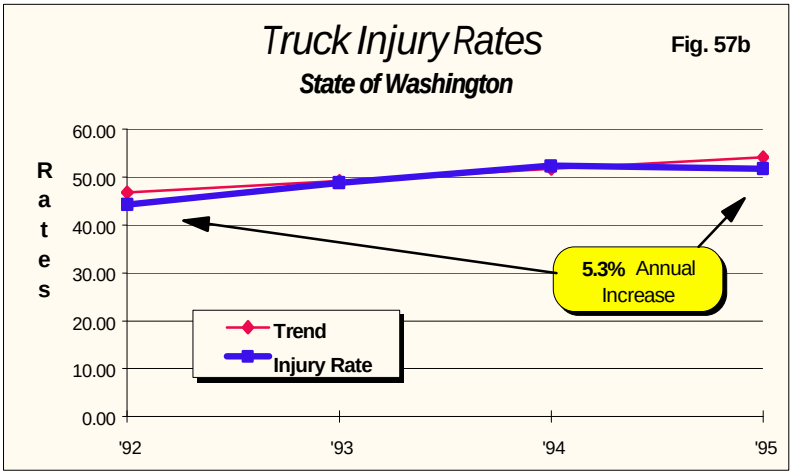
Truck accidents resulting in injury climbed 8.8% per year. In 1992, there were 1,700 injury accidents compared to 2,190 injury accidents in 1995. This represented an increase of 8.8% per year.
The truck injury rate rose at an annual rate of 5.3%. In 1992, there were 44 injuries per 100 million miles compared to 52 injuries per 100 million miles in 1995.



Source: "Washington State Reportable Motor Vehicle Traffic Collision Statistics, WSP; & 1996 Traffic Collisions in Washington State, Washington Traffic Safety Commission, September 1997.

FUTURE

Truck injury collisions are likely to continue upward. Historically, from 1989 to 1995, truck injury collisions were increasing rather slowly at 1.3% per year, or from 2,029 injuries to 2,190 injuries. Collisions with large trucks tends to result in injury. As congestion builds up, the challenge will be to reduce conflicts between large trucks and passenger vehicles.

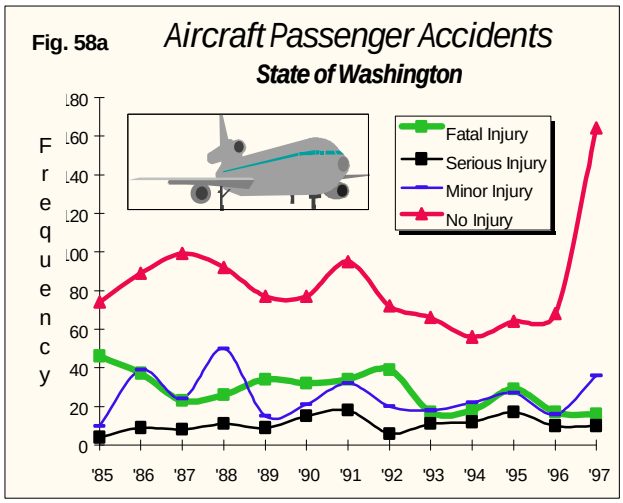


2-3 Aviation Safety

TREND

Aircraft fatalities declined 65.2% over the 12 year period from 1985 to 1997 or from 46 fatalities to 17. This downward trend in fatalities occurred even though the actual number of people involved in all aircraft accidents in the state increased from 136 to 226. The reason for fewer fatalities is not known. However, the majority of the fatal accidents that did occur are attributed to decision errors ("doing the wrong things right"). Minor and non-injury accidents were caused more often by action errors ("doing the right things wrong"). Survivability of aircraft passengers involved in accidents has improved greatly. Non-injuries have increased 6.3% and minor injuries 10.4%.

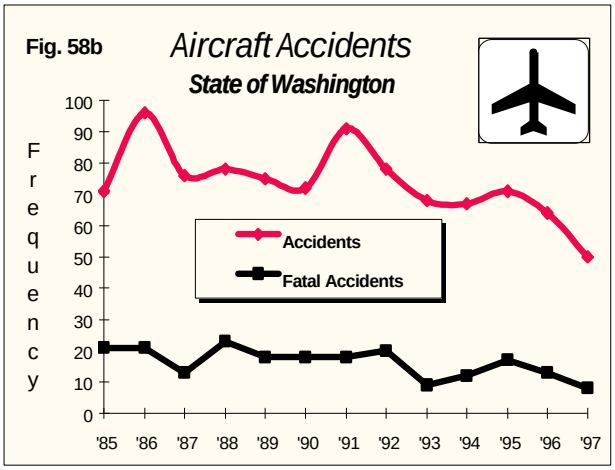
Fig. 58a



FUTURE

Aircraft are involved in fewer accidents than in the past, and when accidents have occurred, fatalities have been fewer. Aircraft accidents and fatal aircraft accidents have been steadily declining and are likely to see further decline due to several reasons: 1) tighter controls on airspace requiring more pilot training, and higher pilot licensing cost; 2) occasional pilots not flying leaving an existing pool of better trained pilots flying; 3) stricter FAA controls on the replacement of aircraft and parts. Research continues in ways of reducing risks. However, training and currency of pilots, and improving procedures, equipment and facilities will also continue to be important in reducing mishaps.

Fig. 58b

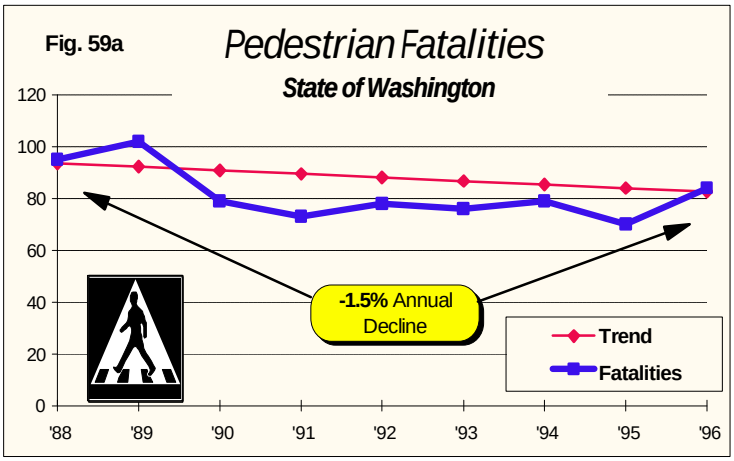


Source: "Aircraft Accidents Occurring in the State of Washington," National Transportation Safety Board

2-3 Pedestrian Safety - Fatalities

TREND

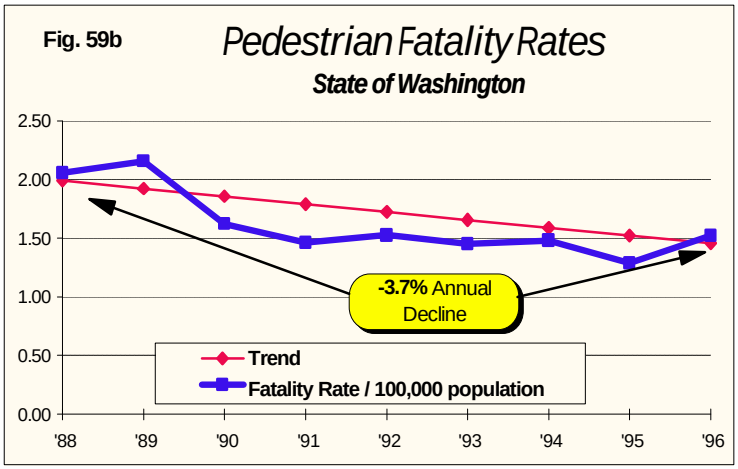
Pedestrian fatalities have been declining over time. In 1996, there were 84 fatalities in the state compared with 95 fatalities in 1988. There was an 11.6% drop in fatalities overall during this period. The annual rate of decline in fatalities was 1.5% per year. This was an encouraging rate of decline.
The pedestrian fatality rate is based on the number of pedestrian fatalities per 100,000 population. This rate was 2.06 in 1988 and 1.52 in 1996, and represented a 3.7% annual decline. Using another measure, in 1995, there were 21.9 fatalities per 100 million miles of pedestrian travel.



Source: "Washington State Reportable Motor Vehicle Traffic Collision Statistics," Washington State Patrol, State of Washington.

FUTURE

Fatal pedestrian accidents seem likely to continue downward as more pedestrian facilities are built which separate pedestrians from having to share right of way with vehicles. People say they would like to walk if they could walk safely.
The basic network for walking exists, but barriers to pedestrian travel also exist such as high speed, high volume roadways, the absence of sidewalks, and narrow roadway shoulders.
Service objective goals propose doubling the amount of walking while reducing the number of accidents by 10 percent over the next twenty years.



2-3 Pedestrian Safety - Injuries

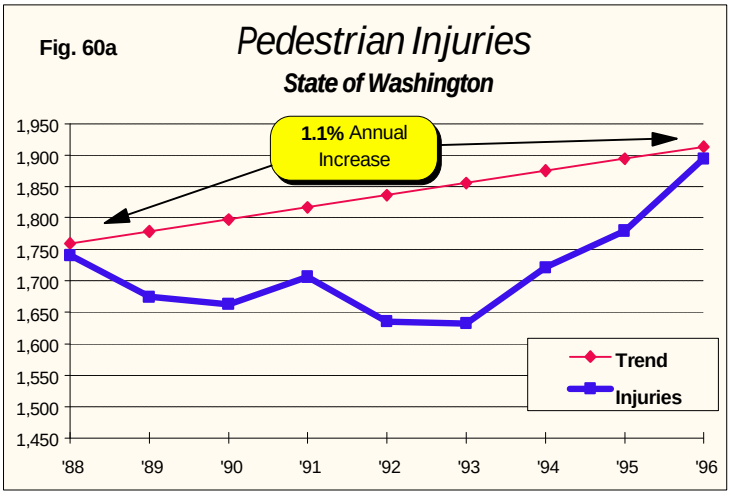
TREND

The number of pedestrians injured increased 1.1% per year from 1988 to 1996. In actual numbers, there were 1,894 injuries to pedestrians in 1996 compared to 1,740 injuries in 1988.

The pedestrian injury rate which is based on the number of injuries per 100,000 population declined from 37.7 injuries per 100,000 population in 1988 to 34.3 injuries per 100,000 population in 1996. This was a 1.2% decline per year in the injury rate.

When person miles traveled are considered, the injury rate in 1995 was 5.6 injuries per million miles of travel by walking as compared to 9.8 injuries per million miles of bicycle travel.

Fig. 60a

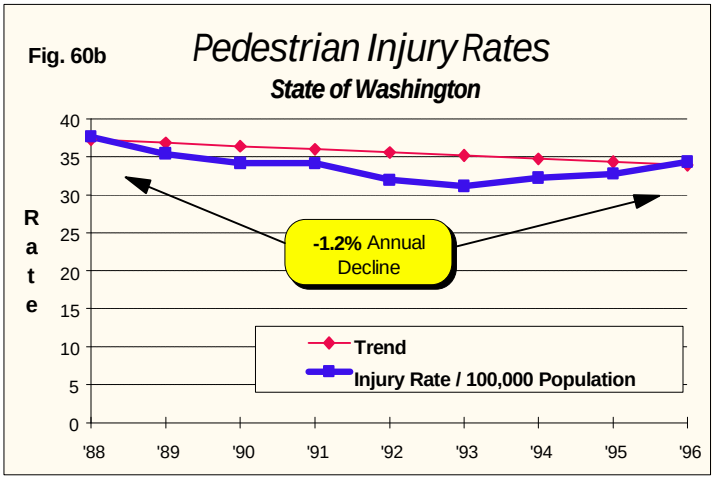


Source: "Washington State Reportable Motor Vehicle Traffic Collision Statistics," Washington State Patrol, State of Washington.

FUTURE

In terms of injuries incurred, pedestrian travel is the safest among the modes reviewed. The number of injuries will continue to climb with the population increasing yearly. However, the pedestrian injury rate has shown a consistent downward trend of 1.2% per year, and is likely to continue downward especially with programs that enhance pedestrian safety. Service objective goals propose doubling the amount of walking while reducing the number of accidents by 10 percent over the next twenty years.

Fig. 60b



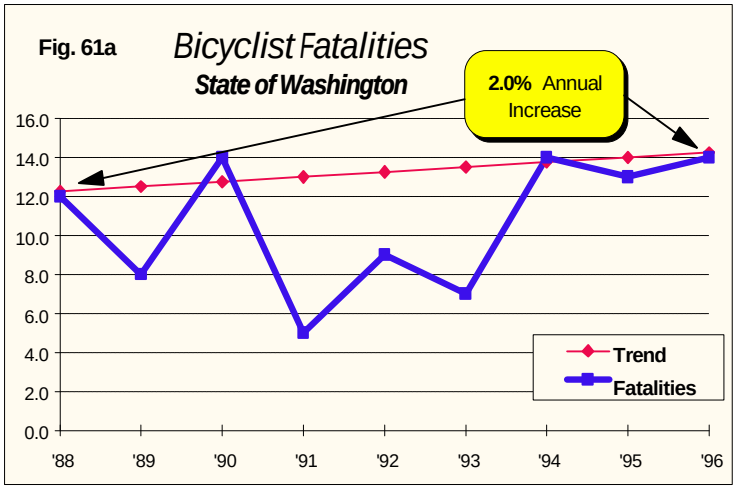
2-3 Bicycle Safety - Fatalities

TREND

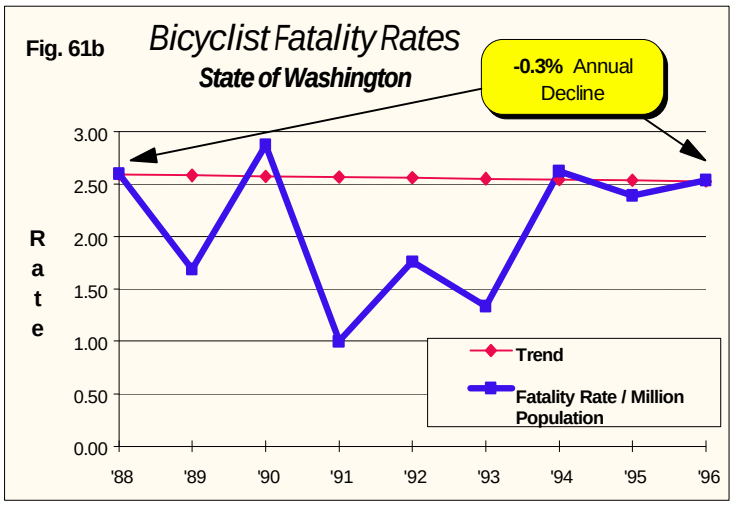
Bicyclist fatalities have been climbing slowly at 2.0% per year from 1988 to 1996. The total number of fatalities have been low and ranged from 12 in 1988 to 14 in 1996. Bicyclist fatality rates, which are based on fatalities per 100 thousand of population have shown a slight decline at the annual rate of 0.3%. The decline was from 2.6 fatalities per 100 thousand of population in 1988 to 2.54 fatalities per 100 thousand in 1996. The fatality rate per 100 million miles of bicycle travel was 7.9 in 1995. In terms of fatalities incurred, bicycle travel was one of the safest modes studied.

FUTURE

The number of bicyclist fatalities is relatively low. It is not known how many fatalities occurred either due to driver negligence or bicyclist negligence. However, safe operation of vehicles and bicycles need to be emphasized through education. Creating a safe network for bicycling is essential to achieve service goals.
Service objective goals propose doubling the amount of bicycling while reducing the number of crashes by 10 percent over the next twenty years.



Source: "Washington State Reportable Motor Vehicle Traffic Collision Statistics," Washington State Patrol, State of Washington.

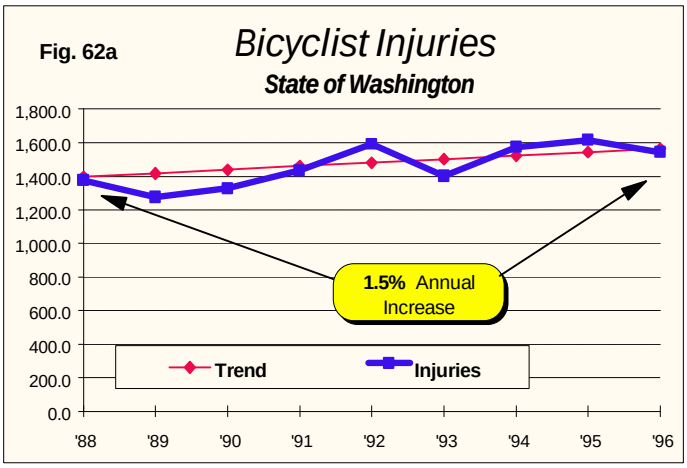


2-3 Bicyclist Safety - Injuries

TREND

There were many more injuries than fatalities among bicyclists. In 1988, 1,375 injuries were counted among bicyclists. In 1996, the number of injuries rose to 1,544. This was an increase of 1.5% per year for that period. Bicycle injury rates based on 100 thousand of population dropped slightly from 29.8 to 28.0 injuries per hundred thousand of population or 0.8% per year from 1988 to 1996. The injury rate per million miles of bicycle travel in 1995 was 9.8. Bicycle injury rates were slightly higher than the pedestrian injury rate which was 5.6 injuries per million miles of travel.

Fig. 62a



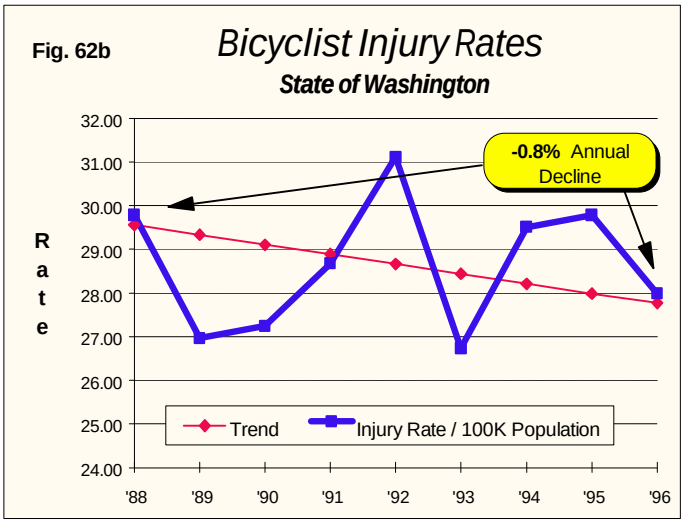
Source: "Washington State Reportable Motor Vehicle Traffic Collision Statistics," Washington State Patrol, State of Washington.

FUTURE

The number of bicyclist injuries may continue increasing. Bicycles are a mode of transportation as well as a recreational option. More bicycles will be in use in our future and reducing conflicts with automobiles will continue to be a large concern. Safe operation of vehicles and bicycles needs to be emphasized through education. Creating a safe network for bicycling is essential to achieve service goals.

Service objective goals propose doubling the amount of bicycling while reducing the number of crashes by 10 percent over the next twenty years.

Fig. 62b

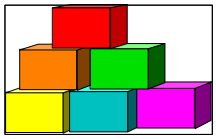


2-3 Pedestrian & Bicycle Safety Comparison - 1995

Table 6

	Pedestrian	Bicyclist
Fatalities in '95	**70**	**13**
Fatality Rate / 100 million miles	**21.88**	**7.88**
Fatality Rate / Million Population	**12.90**	**2.39**
Injuries in '95	**1,779**	**1,617**
Injury Rate/ million miles	**5.56**	**9.80**
Injury Rate/ 100K Pop	**32.76**	**29.78**
Person Miles of Travel (millions)	**320**	**165**
Statewide Population in '95	**5,429,900**	**5,429,900**

Sources: "Washington State Reportable Motor Vehicle Traffic Collision Statistics," Washington State Patrol, State of Washington; and Transportation Planning Office, Washington StateDepartment of Transportation.



2-4 freight & goods

2-4 Port Capacity

TREND

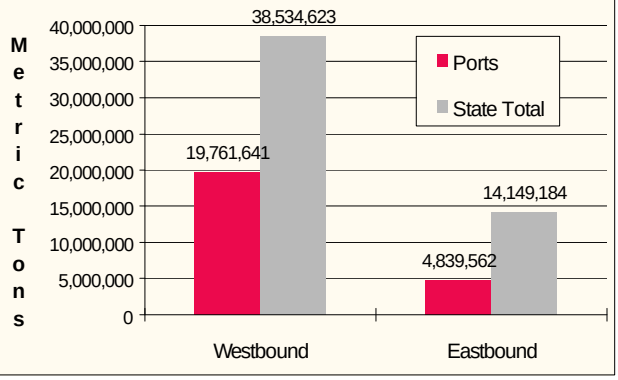
Transhipment of freight is a big industry in Washington. Washington continued to serve as a major hub for freight and goods movement. Half of the westbound traffic coming to the ports is grain. Eastbound traffic from the ports is largely container cargo from Asia. Ports handle 51% of the westbound rail traffic in the state, and 34% of the eastbound rail traffic for the state. This volume of traffic places Washington as a major West Coast competitor.

FUTURE

Port container cargo alone is forecast to grow from 1.2 million containers in1990 to 3.2 million containers by 2015. Fundamental to the ability of ports to handle trade is the network of rail, highway and water modes of freight transport linking the state's ports to points throughout the state and beyond. Puget Sound is already faced with losing market share of West Coast containers. Although exports will start increasing in value, how the Asian market can respond with orders remains to be seen. Larger container ships coming into service will exert a downward pressure on container rates which will be attractive to shippers. This benefits growth but the demand on a freight system to more than double throughput capacity by 2015 must still be faced and will require specialized services and a complex transportation system.

Fig. 63 *Port Generated Rail Traffic*

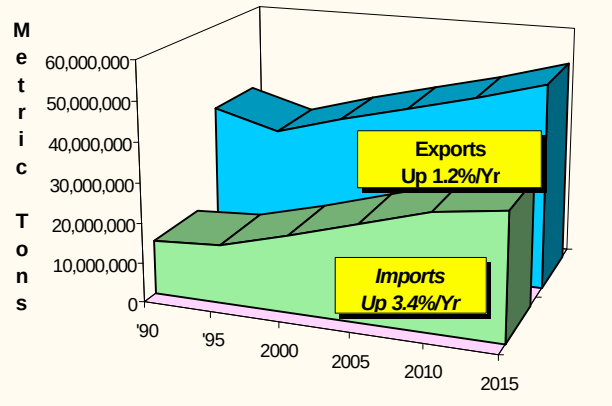
State of Washington



Source: "1995 Marine Cargo Forecast," BST Associates, Jan 31, 1995.

Fig. 64 *Export / Import Ratio*

State of Washington

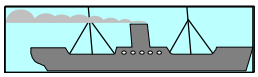


Source: "1995 Marine Cargo Forecast," BST Associates, Jan 31, 1995.

2-4 Marine Freight Capacity

TREND

Over 90% of the West Coast international container trade is TransPacific, and for the U.S. as a whole it makes up over 56%. TransPacific trade includes two major trade routes: NE Asia (30.3 million metric tons in 1995) and SE Asia (3.8 million metric tons). The total for all others was 14 million metric tons in 1995. Cargo on the Lower Columbia accounted for 21 percent of the state's total waterborne commerce. "Other" includes Canada, Europe, Australia, New Zealand & other.



FUTURE

Imports are several times more valuable than exports because imports are typically finished products while exports are semi-processed or lower value products. Washington's waterborne exports such as aluminum and forest products are encountering stress from higher electricity costs, timber availability and price. These regional industries are expected to grow but not quickly enough to overtake imports. In short, the transpacific container system will continue to be driven by higher value imports. Asian trade will account for 64% of the total market share in 2015. This is a slight decline from the 75% share in 1990. Trade with Canada for bulk and breakbulk cargoes will increase its market share. Trade will also increase with other regions such as the Middle East for supplies of crude oil and petroleum.

Containerized Trade

State of Washington

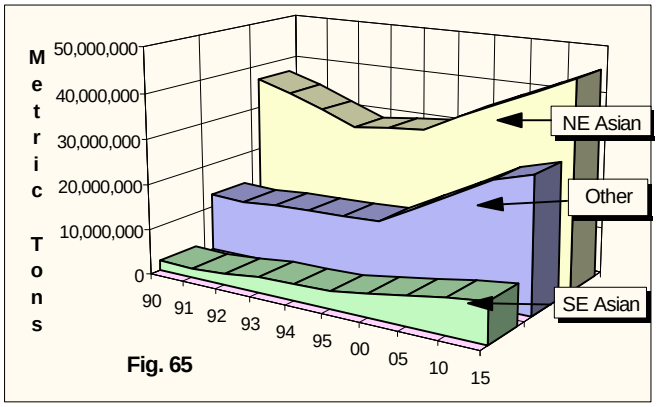


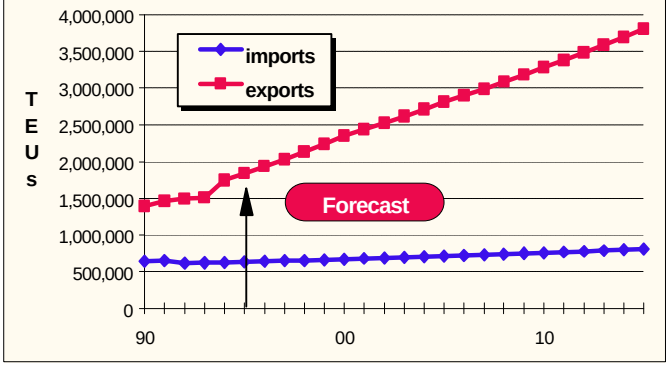
Fig. 65

Source: "1995 Marine Cargo Forecast," BST Associates, Jan 31, 1995.

Fig. 66

Container Forecast

State of Washington



* TEU - Twenty-foot Equivalent Unit: standard container 8x8x20 ft in size.

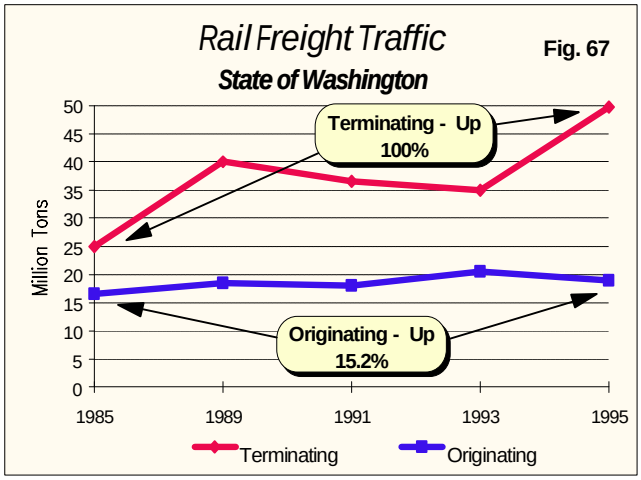
2-4 Rail Freight Capacity

TREND

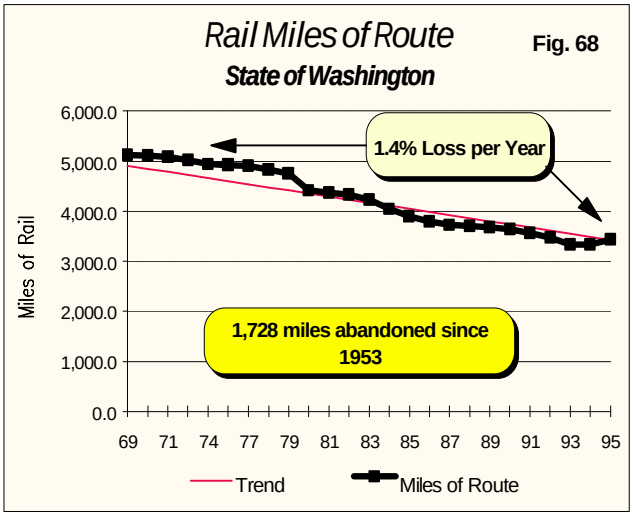
The efficient performance of rail service, trucking and port systems working together is serving to make Washington a major artery of international commerce. Farm products make up half of the commodities being brought to terminals. Other freight rail commodities are lumber, chemicals, food products, petroleum and scrap. The total volume of freight and goods moving into and out of the state rose 65.9% from 41.4 million tons in 1985 to 68.7 millions tons in 1995. Freight terminating in the state was 49.7 million tons in 1995 which was up 100% from 24.9 million tons in 1985. Freight originating in the state was 19 million tons in 1995 which was an increase of 15.2% from 16.5 million tons in 1985.

FUTURE

Freight rail traffic will continue to pick up additional volumes as the rail industry gears up and adds more mainline capacity to meet growing demand. Light density lines which have great commercial value to businesses and farmers will also be important to maintain. As freight rail traffic faces track capacity constraints, and port and roadway congestion increases, the pace of growth will proceed at a somewhat slower pace. Rail congestion at the ports, mainline capacity constraints, and shared use with rail passenger and commuter rail service will also require closer scheduling with a potential to slow volumes. Continued loss of light density lines could also be a problem.



Source: "State Statistics submitted by RRs to WUTC & STB Waybill Sample"



2-4 Truck Traffic: I - 5 Corridor

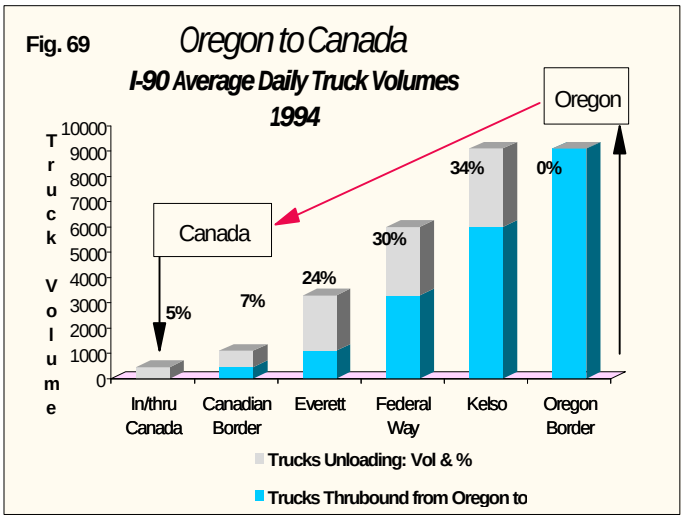
TREND

Over four times as many trucks pass through the Oregon border than the Canadian border. In 1994, 9,100 trucks per day entered Washington from Oregon while 2000 trucks per day entered from Canada. The majority of trucks traveling into Washington from either Canada or Oregon, unload their cargoes in the Central Puget Sound Region. An average of 2,000 trucks crosses into Washington from Canada each day. The majority (78%) of these 2000 trucks entering from Canada deliver their cargo along I-5 in the Central Puget Sound Region. An average of 450 trucks per day (22%) moves completely through the state into Oregon. A majority (95%) of the 9,100 trucks entering from Oregon also unload their cargoes along the I-5 corridor as they travel north. An average of 450 trucks per day (5%) makes it through to Canada (datasets provided on following page).

FUTURE

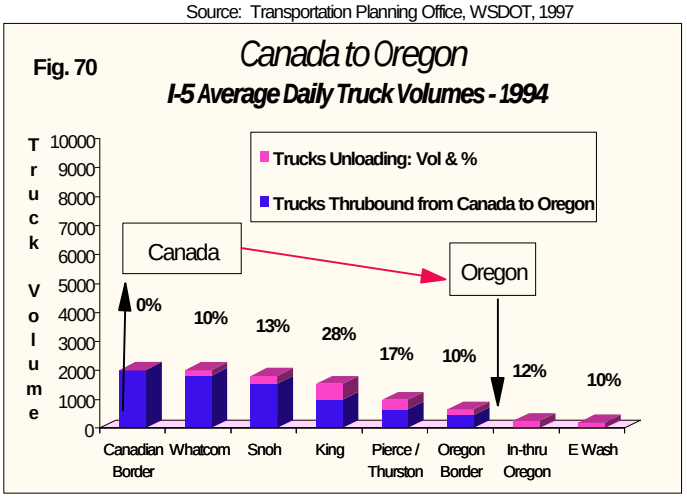
Trucks are an important mode in transporting freight and goods in the Central Puget Sound Region. The versatility and flexibility of trucks will continue to make trucks an attractive mode for transporting freight and goods on the highway system especially along the I-5 corridor. As highway congestion increases, the challenge will focus on how to provide mobility for freight without impacting mobility for passengers.

Fig. 69



Source: Transportation Planning Office, WSDOT, 1997

Fig. 70



2-4 Truck Traffic: I - 5 Corridor

Oregon to Canada

Table 7

	Number of Trucks		
	Thru Traffic	Trucks Unloading	
		Number	%
Oregon Border	9100	0	0.0%
Kelso	6000	3100	34.1%
Federal Way	3300	2700	29.7%
Everett	1100	2200	24.2%
Canadian Border	450	650	7.1%
Within Canada	N.A.	450	4.9%
	Total	9100	100.0%

Canada to Oregon

Table 8

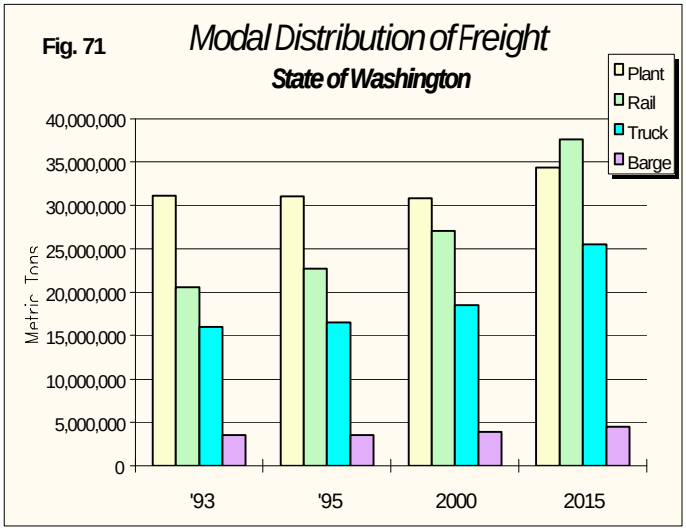
	Number of Trucks		
	Thru Traffic	Trucks Unloading	
		Number	%
Canadian Border	2000	0	0.0%
Whatcom	1800	200	10.0%
Snohomish	1530	270	13.5%
King	980	550	27.5%
Pierce/Thur	650	330	16.5%
Oregon Border	450	200	10.0%
In/thru Oregon	N.A.	250	12.5%
E Wash		200	10.0%
	Total	2000	100.0%

Source: Transportation Planning Office, WSDOT

Over four times as many trucks pass through the Oregon border (9,100) compared to the Canadian border (2000).

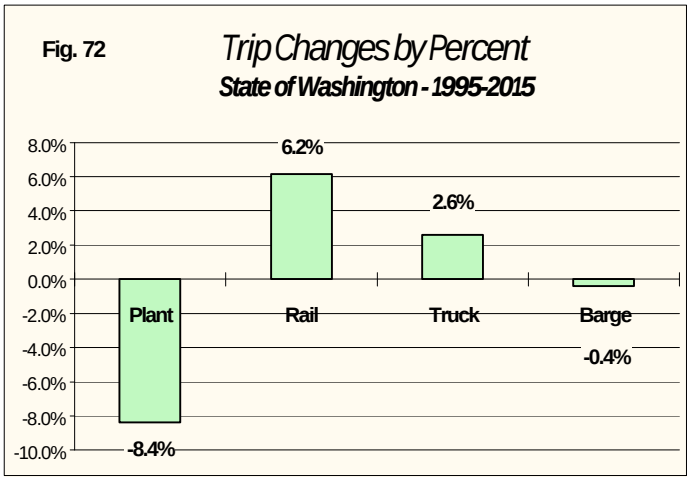
2-4 Freight Modal Choices

Fig. 71



Source: "1995 Marine Cargo Forecast, BST Associates, January 31, 1995

Fig. 72

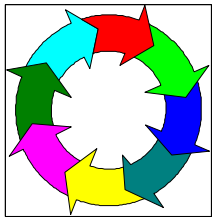


TREND

Freight arriving or leaving Washington's ports, will travel by rail, truck, barge/raft, or move directly into a plant for use. Direct transport of raw material for consumption at plants into products comprises a high percentage of the total freight volume. Rail is efficient in moving large volumes of cargo distances of 500 or more miles, and accounted for 31% of the freight in 1995. Rail is also efficient in moving large volumes of heavier cargo such as petroleum coke on shorter routes. Trucks are more likely to move specialty cargo and carried 22% of the freight in 1995. Barge transport (4.8%) accounts for a substantial portion of grain exports and other dry bulk commodities.

FUTURE

Global competition has placed demands on businesses to increase profitability by limiting stock on hand. Both the rail and truck industries have taken extensive measures to meet the on-time demands of businesses. Under the forecast, rail and truck are expected to increase their modal share of commodities hauled. Improved rail service in the Puget Sound urban area could accelerate a mode shift to rail. In anticipation of increased traffic, the rail industry has developed additional rail capacity and is furthering efforts to regain shares.

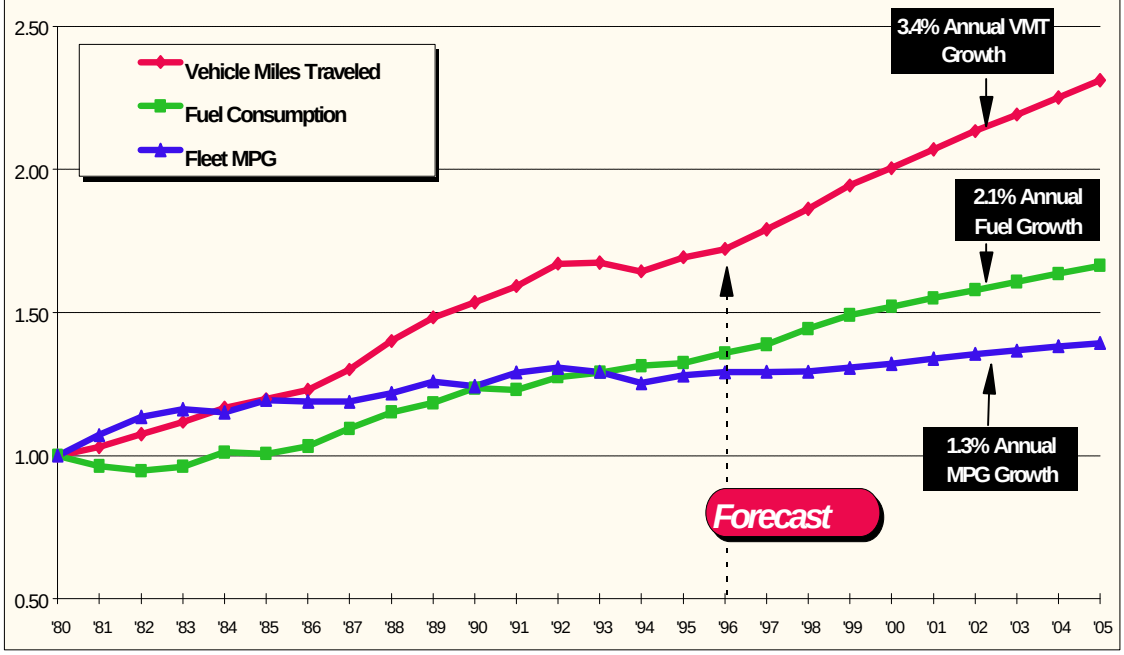


2-5 environmental conditions

2-5 Fuel Consumption and Travel

Fig. 73

State of Washington



Source: Economic Branch, WSDOT

TREND

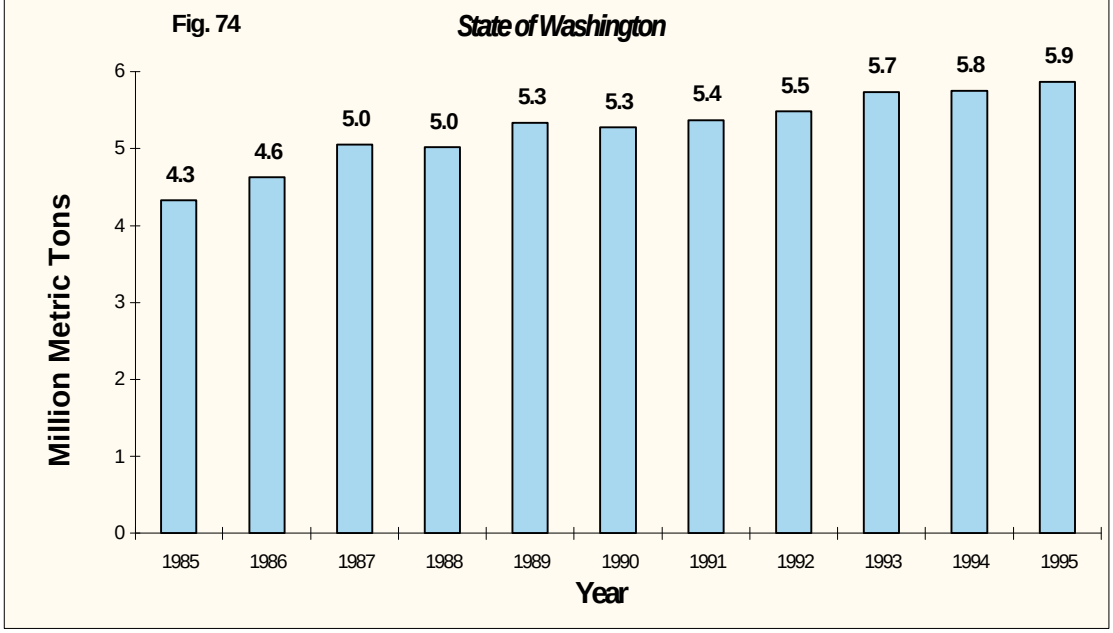
People were driving more. The real price of fuel has remained relatively stable. At the same time, per capita income rose 1.4% per year, and fuel efficiency increased 1.3% per year. These conditions enabled people to drive more. Miles traveled went up 3.4% per year, and annual fuel consumption increased 2.0% per year.

FUTURE

Travel demand will continue rising as stable fuel prices, increased fuel efficiency, more income and a growing population exert their combined influence on the system.

2-5 Carbon Dioxide Emissions

Fig. 74



Source: *Calculation made using state fuel consumption data and national formula (USDOE) to convert to state emissions.

TREND

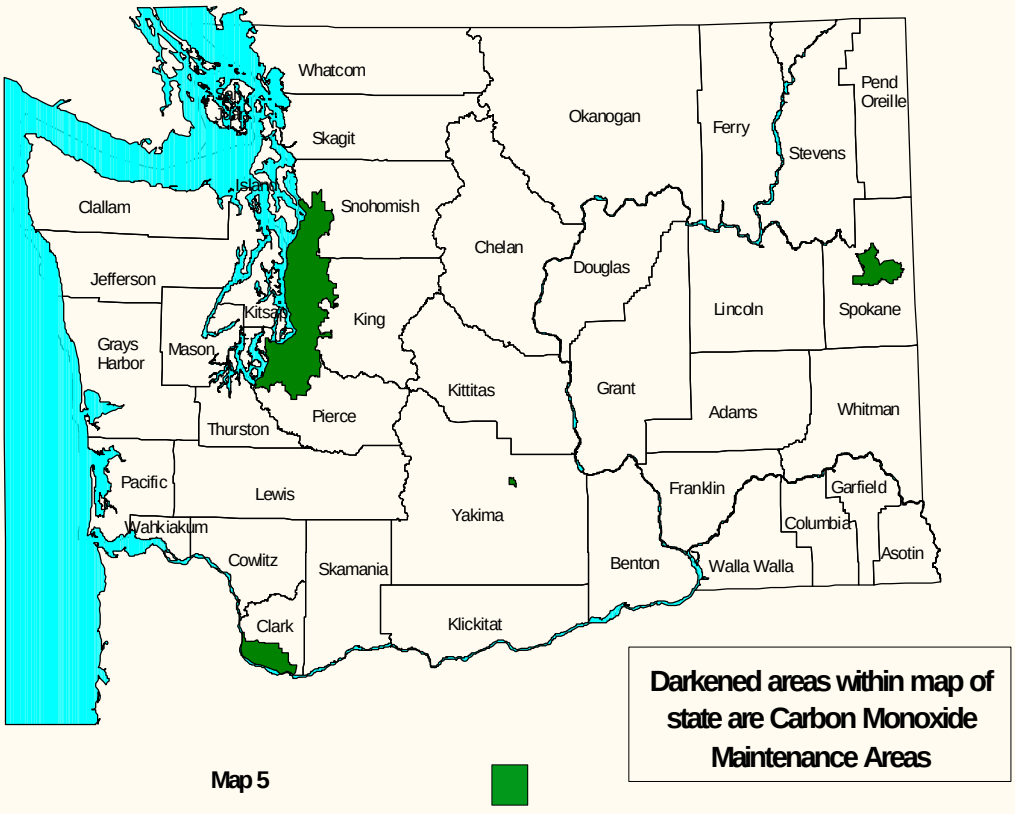
Carbon dioxide accounts for 85% of total greenhouse gas emission, weighted by global warming potential. Transportation's share of these CO2 emissions has remained at about 32%, while total emissions increased 3.1% annually, or 340 million pounds per year. Gasoline contributed more than 60% of the carbon dioxide emissions from transportation.

Despite significant energy efficiency improvements, transportation activity outpaced efficiency gains, resulting in more energy use and subsequent increases in carbon dioxide emissions.

FUTURE

According to DOE, carbon dioxide emissions from transportation are expected to increase 1.3% annually through 2010.

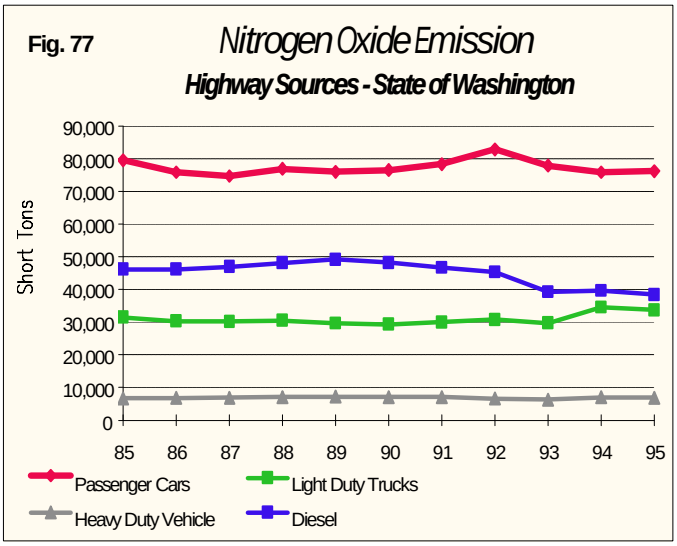
Carbon Monoxide Maintenance Area



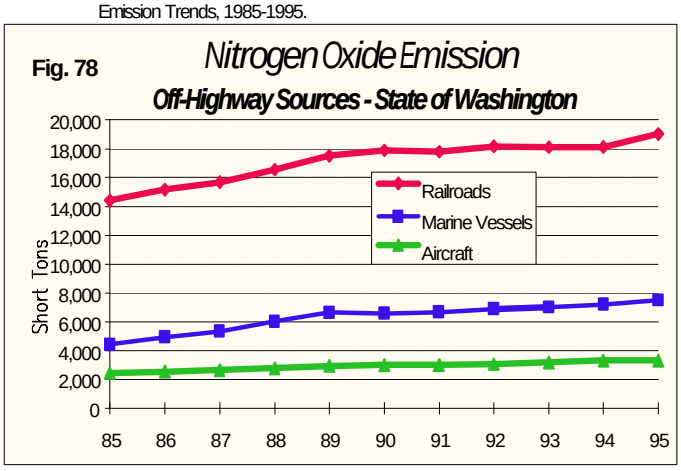
Map 5

Source: Environmental Affairs Office, WSDOT

2-5 Nitrogen Oxide



Source: U.S. Environmental Protection Agency, National Air Pollutant Emission Trends, 1985-1995.



TREND

The Clean Air Act of 1970 called for National Ambient Air Quality Standards. Nitrogen oxide was one of six air pollutants for which the EPA set primary air quality standards. Nitrogen oxide contributes to the formation of ground level ozone which is present in smog. Over the last ten years, average concentrations of all six pollutants have decreased at 4000 sites across the U.S. Vehicle emissions of nitrogen oxide stayed down despite the rise in vehicle miles travels. Tailpipe emission standards for new vehicles and reducing harmful substances from fuel have contributed to curbing air pollution from transportation. In Washington, from 1985 to 1995, total nitrogen oxide emissions dropped -0.43% for passenger cars, and total emissions for all class of highway vehicles dropped 5.3%.

FUTURE

Nitrogen oxide emissions on highways will stay at or below current levels. Off-highway sources of nitrogen oxide emissions will continue to climb . Since 1985, highway sources reduced emissions by 5.3%. Off-highway sources which include railroads, marine vessels and aircraft increased nitrogen oxide emissions by 40.2%.

Ozone Maintenance Area

Map 6

Source: Environmental Affairs Office, WSDOT

Small Particulate Maintenance Area

Darkened areas within map of state are Small Particulate Maintenance Areas

Map 7

Source: Environmental Affairs Office, WSDOT